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LATE JURASSIC FORAMINIFERA FROM THE AKLAVIK RANGE, NORTHWEST TERRITORIES

by

ADAM STEFAN HEDINGER, BSc.

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
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FALL, 1979

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read and recommend to the Faculty of Graduate Studies for acceptance, a thesis titled "Late Jurassic Foraminifera from the Aklavik Range, Northwest Territories", submitted by Adam S. Hedinger, BSc., in partial fulfilment for the degree of Master of Science.

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"MANY A BEAUTIFUL THEORY HAS BEEN SLAIN BY AN UGLY FACT..."

g. d. hodgson

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ABSTRACT

One hundred and fifty-eight species belonging to forty-eight genera (twenty-eight agglutinated and twenty calcareous) of Foraminifera are described and figured from the Late Jurassic (Oxfordian to Portlandian) portion of the Husky Formation at Martin Creek, Aklavik Range, Northwest Territories.

The unusually well preserved and prolific microfauna consists of: *Bathysiphon* (1 species), *Hippocrepina* (1), *Saccammina* (3), *Ammodiscus* (6), *Arenoturrispirillina* (3), *Glomospira* (3), *Turritellella* (2), *Tolypammina* (2), *Lituotuba* (2), *Reophax* (6), *Haplophragmoides* (2), *Cribrostomoides* (3), *Evolutinella* (1), *Trochamminoides* (1), *Recurvoides* (9), *Ammobaculites* (11), *Haplophragmium* (4), *Ammobaculoides* (2), *Spiroplectammina* (1), *Textularia* (2), *Pseudobolivina* (2), *Siphotextularia* (4), *Trochammina* (13), *Ammosphaeroidina* (1), *Verneuilina* (2), *Verneuilinoides* (3), *Eggerella* (*Eomarssonella*) (2), *Orientalia* (4), *Astacolus* (3), *Citharina* (2), *Dentalina* (7), *Geinitzinita* (1), *Ichtyolaria* (1), *Lenticulina* (5), *Marginulina* (2), *Marginulinopsis* (4), *Nodosaria* (4), *Planularia* (1), *Pseudonodosaria* (5), *Saracenaria* (5), *Vaginulinopsis* (3), *Tristix* (2), *Eoguttulina* (1), *Globulina* (1), *Ceratocancris* (1), *Conorboides* (1), *Pseudolamarckina* (1) and ?*Spirillina* (2). Over 50% of the forms belong to new specific and/or generic taxa.

Five zones and nine subzones are informally established for the Lower Member of the Husky Formation. These zones are tied in to known megafossil data to define a standard outcrop section for use in calibration of subsurface data in the adjacent Mackenzie Delta - Beaufort Sea area.

The microfauna has a marked "boreal" faunal affinity, and is most closely comparable with coeval assemblages from the Canadian Arctic Archipelago, Alaska, and western Siberia.

Evidence is presented demonstrating the coexistence of two distinct faunules of "larger" and "smaller" foraminifers within the same suites. This bimodal distribution of genera has potentially important significance in interpretations of paleoecology and depositional environment based on foraminiferal data.

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FRONTISPIECE

Dr. W. W. Brideaux standing on the contact between Middle Jurassic Bug Creek Formation sandstones and Upper Jurassic (Oxfordian) Husky Formation shales, Martin Creek, Aklavik Range, Northwest Territories.

CHAPTER I

INTRODUCTION

Scope of Project

The Jurassic microfaunas of the Arctic region of North America are little known. Comprehensive studies are few and relatively out of date. Moreover, the majority of these studies are concerned with the microfaunas of the north slope of Alaska.

In an effort to encourage new investigations, the Geological Survey of Canada initiated (1973) an informal project aimed at creating a "standard reference section" for the Upper Jurassic to basal Cretaceous (mid-Berriasian) Husky Formation of the northeastern Yukon Territory - Mackenzie Delta area. A complete, unfaulted [assumed, in 1973, to be complete and unfaulted] section of the Husky Formation was selected on Martin Creek in the Aklavik Range of the northern Richardson Mountains, Northwest Territories. This section was studied in some detail during the summer of 1975 and extensively sampled for macrofossils, microfossils and palynology.

This thesis forms an integral part of this aforementioned larger study and is principally concerned with the taxonomy, systematics, paleoecology and stratigraphic distribution of the "smaller" Foraminifera (minus 80 mesh) of the Lower Member (Oxfordian to Portlandian) of the Husky Formation. In addition, this study demonstrates that there is evidence for the co-existence - within the same suites - of two almost mutually exclusive (i.e. of differing generic composition) foraminiferal populations based on size fractions. These populations have been informally termed "smaller" Foraminifera (minus 80 mesh) and "larger"

Foraminifera (plus 80 mesh). This little noticed phenomenon has potentially important implications for the interpretation of paleoenvironments and paleoecology.

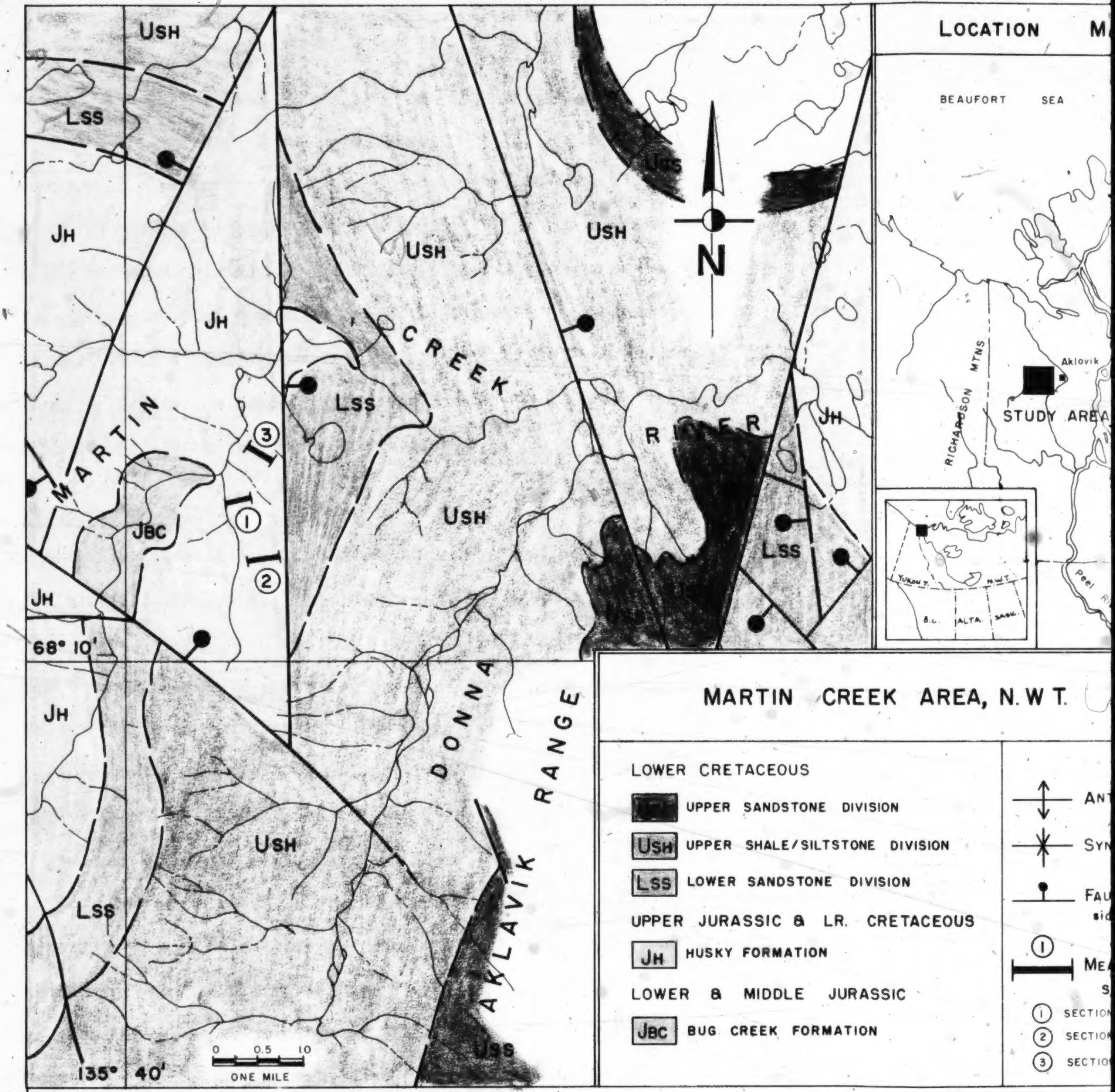
Research on the other components of the Husky Formation study is being currently conducted at the University of Saskatchewan ("larger" Foraminifera, pollen and spores), Amoco Canada Petroleum Co. Ltd. (Dinoflagellates) and Petro-Canada Ltd. (Ostracodes).

Location and Preparation of Source Material

The samples utilized in this study were collected in the summer of 1975 from three outcrop sections of the Husky Formation measured along Martin Creek in the Aklavik Range of the northern Richardson Mountains, District of Mackenzie, Northwest Territories. (Figure 1 shows the location of the sampled sections; see also Plates 1 and 2.)

The sections were measured with a 1.5 meter (≃ 5 foot) Jacob staff. Approximately 0.5 kilogram spot samples were taken at intervals of either 1.5 meters (about 5 feet) or 3.0 meters (about 10 feet) throughout each of the sections. A pit was dug at each sample site to remove weathered material and insure that only fresh material would be available for the study. In most cases it was found to be impractical to dig more than 0.3 meters (about 1 foot) owing to the presence of permafrost near the surface. Macrofossils (ammonites, pelecypods, gastropods) were collected wherever encountered in order to date the section as accurately as possible against international standards.

For the purposes of this study, samples of 150 grams were placed in jars, covered with water, and allowed to stand until the soaking action could have an appreciable effect on softening the


USH
LSS
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MARTIN
CREEK
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JH
JH
USS
USS
3
1
2
68° 10'
135° 40'
DONNA
AKLAVIK
RANGE
0 0.5 1.0
ONE MILE
N
LOCATION M
BEAUFORT SEA
Aklavik
RICHARDSON MTNS
STUDY AREA
Peel
YUKON T.
N.W.T.
B.C.
ALTA.
SASK.
MARTIN CREEK AREA, N.W.T.
LOWER CRETACEOUS
USS UPPER SANDSTONE DIVISION
USH UPPER SHALE/SILTSTONE DIVISION
LSS LOWER SANDSTONE DIVISION
UPPER JURASSIC & LR. CRETACEOUS
JH HUSKY FORMATION
LOWER & MIDDLE JURASSIC
JBC BUG CREEK FORMATION
ANT
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1
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1 SECTION
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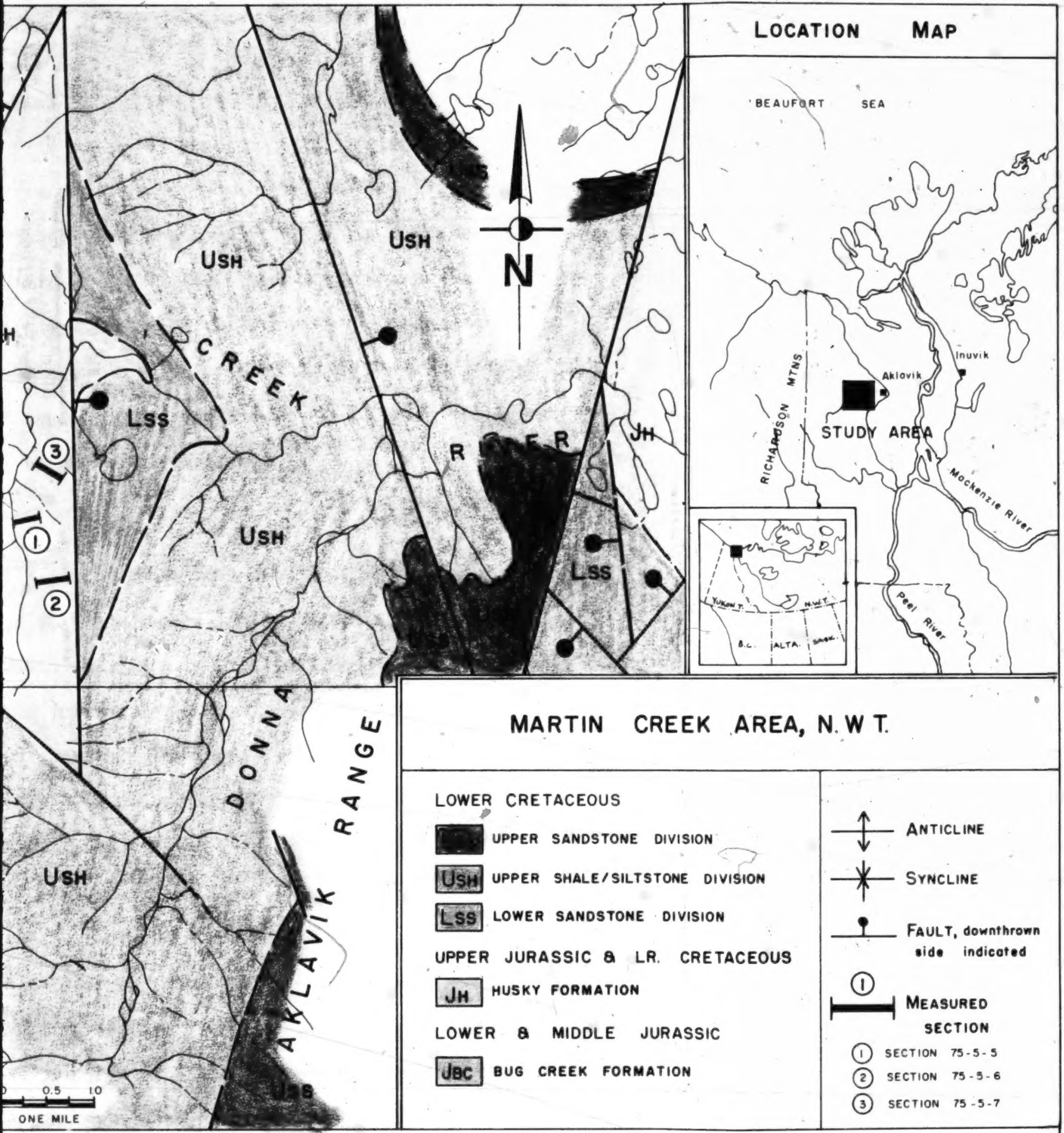
FIGURE I LOCATION and GEOLOGY of STUDY AREA

1 of


LOCATION MAP
BEAUFORT SEA
RICHARDSON MTNS
Aklovik
Inuvik
STUDY AREA
Mackenzie River
Peel River
YUKON T.
N.W.T.
B.C.
ALTA.
SASK.
N
USH
LSS
JH
CREEK
RIVER
DONNA
AKLAVIK RANGE
0 0.5 1.0
ONE MILE
MARTIN CREEK AREA, N.W.T.
LOWER CRETACEOUS
UPPER SANDSTONE DIVISION
USH UPPER SHALE/SILTSTONE DIVISION
LSS LOWER SANDSTONE DIVISION
UPPER JURASSIC & LR. CRETACEOUS
JH HUSKY FORMATION
LOWER & MIDDLE JURASSIC
JBC BUG CREEK FORMATION
ANTICLINE
SYNCLINE
FAULT, downthrown side indicated
MEASURED SECTION
① SECTION 75-5-5
② SECTION 75-5-6
③ SECTION 75-5-7

RE I LOCATION and GEOLOGY of STUDY AREA

2 of 2

material. Strongly indurated shales and sandstones were first crushed with a mortar and pestle prior to soaking to facilitate disintegration. The samples were washed and sieved through standard Tyler 60, 80, and 100 mesh screens with a pan being used to catch the residual fines. The remaining material was then boiled with either Sparkleen or Quaternary O detergent to break down the clay fraction and then sieved through a 200 mesh screen. Any - 200 fines.were discarded. The residues were dried, bottled and picked with the aid of a stereoscopic microscope. Three slides were prepared for each sample: one containing the 60 mesh fraction, a second containing the 80 and 100 mesh fractions, and a third containing the 200 mesh fraction.

Photographic Method

Traditionally, two methods have been employed in illustrating foraminifers for publication: camera lucida sketches and photography. The former, while yielding generally excellent results is both time consuming and open to inadvertant abuse through over- or misinterpretation of the test structure. The latter can produce good results, but suffers in the illustration of agglutinated forms due to the Becke - line effect" problems produced by light reflecting off the quartz grains making up the test wall.

In recent years, scanning electron microscope (S.E.M.) photomicrographs have been extensively used to illustrate foraminifers. This method solves the high reflectivity problem of arenaceous foraminifers, as specimens must be gold-plated prior to examination under the S.E.M. Scanning electron micrographs also give unparalleled depth of field resolution. Unfortunately, the gold plating process obscures any but the surface details of the specimens being studied. Thus foraminifers with smooth-walled tests (e.g. Recurvoides, Lenticulina and other nodosarids) as well as coarsely agglutinated forms are often very difficult to interpret from S.E.M. micrographs.

The method used in the present study was developed by Dr. W. K. Braun of the Department of Geological Sciences at the University of Saskatchewan. In the illustration of "larger" agglutinated foraminifers (60 to 100 mesh fraction) it produces demonstrably superior results to any of the abovementioned methods. Prior to photography the specimens are first coated with an aqueous solution of methyline blue, and subsequently dusted with ammonium chloride. The methyline blue dye penetrates and concentrates along sutures and other lows on the test surface, while the ammonium chloride powder settles on the highs. When photographed, this coating method renders superior detail of all test features, not only those of its surface. An added advantage of the method is that both coating mediums are readily soluble in water, and therefore do not present the problems encountered with the removal of gold-plating from "type" specimens.

All specimens were photographed using a standard Leitz Orthomat microscope camera equipped with condenser lenses. Lighting was provided by two variable intensity lamps set on either side of the specimen. Photographs were made using Ilford Pan F fine grain (50 ASA) film and developed in Ilford ID-11 fine grain developer. Prints were made on Ilford Ilfobrom 2.1P paper.

All figured specimens from this study are deposited in the Type Collections of the Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario. A set of duplicates is deposited in the Paleontological Collection of the Department of Geology, University of Alberta, Edmonton, Alberta. The prepared slides are stored at the Institute of Sedimentary and Petroleum Geology, 3303 - 33rd Street NW, Calgary, Alberta.

Previous Geological Work

Lithological - Stratigraphical Studies - Initial observations of the Mesozoic succession in the northern Richardson Mountains were made during the course of more general surveys by McConnell (1891), Camsell (1906), Nauss (1944) and Gabrielse (1957). These workers established the presence of marine Upper Jurassic or Lower Cretaceous sediments on Mount Gifford and along the Willow (Donna) River and of Lower Cretaceous rocks on Mount Goodenough. The geologists of the Canol Project restricted their investigations (for the most part) to the region of the Peel and Lower Mackenzie Rivers. The results of their work was ably summarized by Hume and Link (1945), and Hume (1954).

The first detailed geological reconnaissance in the northern Richardson Mountains was carried out by Jeletzky (1958, 1960, 1961a) who initially confined his studies to the thick Jura - Cretaceous succession in the Aklavik Range and areas immediately adjacent. Jeletzky (1967) formally subdivided the Jurassic strata exposed therein into three formations: the predominantly arenaceous Bug Creek Formation, of Lower and Middle Jurassic age, the overlying, predominantly argillaceous Husky Formation, of Upper Jurassic to basal Cretaceous (mid Berriasian) age, and its coarse clastic equivalent, the North Branch Formation.

In subsequent years, Jeletzky expanded his studies to embrace all of the northern Yukon as far south as the Kandik and Porcupine Rivers (Jeletzky, 1971, 1972, 1974). Within north-central Yukon he recognized the presence of an Upper Jurassic sandstone unit - later formally described as the Porcupine River Formation (Jeletzky, 1977) - which grades laterally into the Husky Formation to the east and the Kingak shales to the west. Besides producing the abovementioned stratigraphic - biostratigraphic studies, Jeletzky also attempted the first regional syntheses of the geological history of this area during Jurassic and Cretaceous time (Jeletzky, 1961, 1975).

Current studies undertaken by the officers of the Geological Survey of Canada (Poulton and Callomon, 1976; Frebold and Poulton, 1977) are aimed at refining certain aspects of Jeletzky's pioneering work, particularly with regard to the Lower and Middle Jurassic succession in the northern Yukon Territory.

Exploratory drilling in the Mackenzie Delta - Beaufort Sea area began in 1965 when the Gulf-Shell-Imperial consortium drilled the Reindeer D-27 well, which penetrated a thick succession of Cretaceous and Tertiary sediments. Since that time over 100 wells have been completed in the Mackenzie Delta area and on its flanks, with several significant hydrocarbon discoveries having been made in Lower Cretaceous and Tertiary strata. These boreholes have provided invaluable stratigraphic and biostratigraphic control points. Young, Myhr and Yorath (1976) combined much of the available subsurface and outcrop data to produce the first comprehensive synthesis of the Mesozoic history of the northern Yukon - Mackenzie Delta region.

Detterman et. al. (1975) have reviewed past investigations of the Jurassic System in northern Alaska. Leffingwell (1919) named and described the Kingak Shale from exposures in the Canning River region of northern Alaska. Although he believed the Kingak to be of Early Jurassic age, subsequent workers have demonstrated that it spans all portions of the Jurassic - though not all stages appear to be present.

Paleontological Studies - Megapaleontological studies in the northern Yukon and adjacent District of Mackenzie have, in recent years, been carried out by Frebold (1961, 1975) and Jeletzky (1958, 1960, 1962, 1966, 1967, 1973). The former described ammonite faunas from both the northern mainland and the Canadian Arctic Archipelago, and correlated them with the standard Jurassic zones of Europe. The latter concerned himself mainly with Late Jurassic and Cretaceous faunas and the problem of delineation of the Jurassic - Cretaceous boundary in the boreal realm. Because of the acute lack of ammonites within the Upper Jurassic - Lower Cretaceous (Neocomian) succession in the northern Yukon - Mackenzie Delta area, Jeletzky's zonal scheme based on the pelecypod Buchia has proven invaluable in sorting out the biostratigraphy of the region.

More detailed studies aimed at upgrading our understanding of the Lower and Middle Jurassic faunas are currently underway, with some results at publication stage (Frebold and Poulton, 1977; Poulton and Callomon, 1976; Poulton, in press).

In Alaska, Imlay (1959, 1961, 1973) has carried out virually all of the recent paleontological studies of the Jurassic System.

His work serves as the basis for the current biostratigraphic zonation of the Alaskan Jurassic.

Foraminiferal Studies - The total amount of North American literature available on Jurassic Foraminifera is small when compared with that available on Cretaceous and Tertiary microfaunas. This is particularly true when dealing with the northern (Arctic) reaches of North America, i.e.: Alaska, the northern Yukon Terrotory and the Northwest Territories.

Tappan (1955) published the first comprehensive treatment of the Jurassic foraminiferal faunas of Alaska's north slope. This was supplemented by Bergquist (1966) who provided a detailed synthesis of Alaskan Mesozoic foraminiferal biostratigraphy. However, Tappan's pioneering work has remained to the present time the only concise, systematic paper on the fauna of this region, with few or no modifications having taken place from the original publication.

The zonation proposed by Tappan has remained unchanged for over twenty years. Recent stratigraphic - biostratigraphic studies in northeastern Alaska (Detterman et. al., 1975) have revealed serious shortcomings in Tappan's Jurassic zonation that will make cause for a re-evaluation on many of the published age assignments of Alaskan Jurassic Foraminifera.

Analysis of foraminiferal faunas collected from a reference section of the Kingak Shale in the Ignek River valley of Alaska (Detterman et. al., 1975) - for which excellent ammonite-pelecypod control exists - revealed that:

> "Despite the large assemblage, however, the Foraminifera in general are not particularly useful in delineating stages of the Jurassic because many are longranging or they appear in beds that are older or younger than those from which they are described. Most of the arenaceous forms range throughout the entire section, although some were originally described from the Lower Jurassic (Toarcian - Pliensbachian) beds of northern Alaska and had been considered indicative of early Jurassic age and some species which were described from beds of late Jurassic age occur only in older beds in this section. ..."

The authors (Detterman et. al., op. cit.) continue by remarking that:

> "There is no ready explanation for the apparently unrestricted range of many of the Foraminifera in the Ignek Valley section... If it were only a matter of older forms occuring in younger beds it could be explained by cannibalization and reworking of older into younger deposits; but the presence of presumed late Jurassic forms in Middle Jurassic beds cannot be explained as easily. Apparently a re-evaluation of the published age assignments of the Foraminifera for the Jurassic of northern Alaska is in order."

To date in Canada (and despite the active quest for hydrocarbons in the northern regions) there has been no comprehensive treatment of Arctic Jurassic microfaunas. Chamney (1971) described a few new and biostratigraphically useful species characteristic of the Jurassic - Cretaceous boundary beds in the Mackenzie Delta area and Arctic Islands. Souaya (1976) illustrated the Foraminifera recovered from the Sun - Gulf - Global Linckens Island P-46 borehole and provided a zonal scheme for the Jurassic interval. His paper, however, lacks detailed systematics. Wall (in Balkwill, Wilson and Wall, 1977) provided a checklist of Upper Jurassic microfaunas from the Ringnes Formation of the Canadian Arctic Archipelago. Apart from these published studies, Yorath (1962) examined microfaunas from the Deer Bay Formation of the central Arctic Islands for an M.Sc. study at the University of Alberta.

The Jurassic foraminiferal faunas of the western interior of North America are (comparatively) much better known than their northern counterparts. Wickenden (1933) initiated studies of Jurassic microfaunas recovered from well cuttings from Alberta and Saskatchewan. Subsequent work by Loeblich and Tappan (1950a, 1950b), Lalicker (1950), Wall (1960), and Brooke and Braun (1972) has provided an excellent, detailed description of the Jurassic of this area. Unfortunately, these assemblages are, for the most part, almost completely different at the specific, and, in some cases, at the generic level from those found in the northern regions; and therefore are not pertinent to this study.

Since the two faunal realms (i.e. Boreal and Western Interior) appear to be nearly mutually exclusive, the significance of the Jurassic shales of western Alberta and northeastern British Columbia looms apparent. Brooke and Braun (in press) have made a comprehensive study of the microfauna of the Fernie shales of northeastern British Columbia and kindly provided the author access to relevant portions of their manuscript. Their research demonstrates that this geographic area is, in part, a zone where mixed faunas occur, with elements characteristic of both boreal and western interior assemblages present.

Outside of North America, the Upper Jurassic foraminiferal faunas of Siberia bear a striking resemblance to those of the North American Arctic. These faunas have been well documented by Myatliuk (1939), Dain and Kuznetsova (1971), and Dain et. al., (1972).

Ostracode Studies - In general, ostracodes form only a minor constituent of the total microfaunal assemblage of the Jurassic System in the northern (boreal) regions of North America. They occur rarely (and often rather erratically) throughout the section. To date, there has been no comprehensive treatment of ostracode faunas from this region. The only published reference is that of Wall (in Balkwill, Wilson and Wall, 1977) commenting on the microfaunas of the Ringnes Formation (Upper Jurassic) of the Canadian Arctic Archipelago.

CHAPTER II

JURASSIC STRATIGRAPHY OF NORTHERN YUKON AND ADJACENT DISTRICT OF MACKENZIE

The regional stratigraphic setting relates Upper Jurassic sediments of the Aklavik Range (Husky Formation) to those of the Northern Yukon and Mackenzie Delta areas. Inter-regional correlations of the Jurassic strata of Arctic North America are shown in Figure 2. The interpretations of paleogeography and depositional history presented below are drawn principally from Jeletzky (1975) and Young, Myhr and Yorath (1976).

Tectonic Elements

Those tectonic elements affecting Jurassic sedimentation in the northern Yukon - Mackenzie Delta areas are shown in Figure 3 and briefly described below. The structural term encompassing the whole area is the Beaufort - Mackenzie Basin (Young et. al., 1976). The component basins and arches are - for the most part - Mesozoic (Columbian) elements and do not necessarily reflect the present day (superimposed) Laramide trends.

The Keele - Old Crow Landmass (term coined by Jeletzky, 1971, 1972) comprises the Jurassic and Early Cretaceous eastward extension of the ancestral Brooks Range of Alaska. This landmass was situated adjacent to the southeasterly trending Blow Trough which is believed to have been connected with the Kandik Basin of east-central Alaska via the Keele-Kandik Trough. The former is, in large measure, equivalent to the Porcupine Plateau - Richardson Mountain Trough of Jeletzky (1961, 1975), although it's southern reaches (as illustrated) are at some variance with Jeletzky's own interpretations. The Eagle

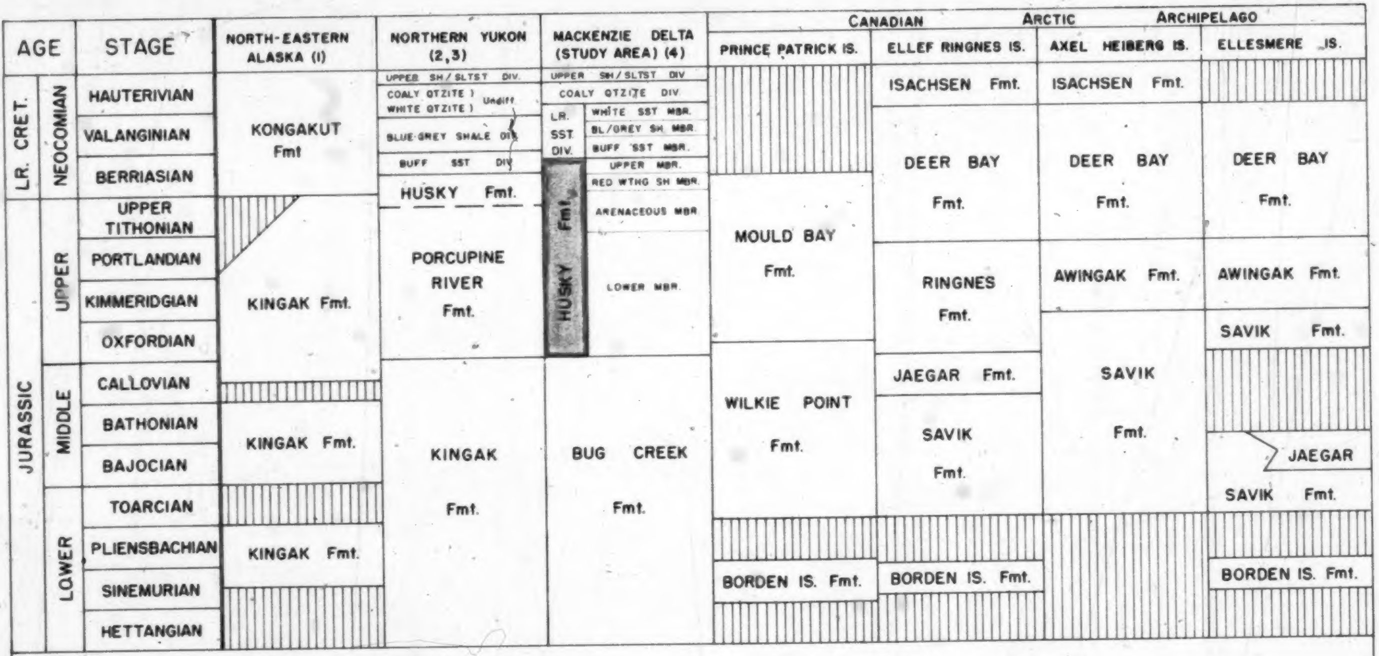

AGE
STAGE
LR. CRET.
NEOCOMIAN
JURASSIC
UPPER
MIDDLE
LOWER
HAUTERIVIAN
VALANGINIAN
BERRIASIAN
UPPER TITHONIAN
PORTLANDIAN
KIMMERIDGIAN
OXFORDIAN
CALLOVIAN
BATHONIAN
BAJOCIAN
TOARCIAN
PLIENSBACHIAN
SINEMURIAN
HETTANGIAN
NORTH-EASTERN ALASKA (1)
KONGAKUT Fmt
KINGAK Fmt.
KINGAK Fmt.
KINGAK Fmt.
NORTHERN YUKON (2,3)
UPPER SH/SLTST DIV.
COALY QTZITE)
WHITE QTZITE) Undiff.
BLUE-GREY SHALE DIV.
BUFF SST DIV
HUSKY Fmt.
PORCUPINE RIVER Fmt.
KINGAK Fmt.
MACKENZIE DELTA (STUDY AREA) (4)
UPPER SH/SLTST DIV
COALY QTZITE DIV
LR. SST. DIV.
WHITE SST MBR.
BL/GREY SH MBR.
BUFF SST MBR.
HUSKY Fmt.
UPPER MBR.
RED WTHG SH MBR.
ARENACEOUS MBR.
LOWER MBR.
BUG CREEK Fmt.
CANADIAN ARCTIC ARCHIPELAGO
PRINCE PATRICK IS.
MOULD BAY Fmt.
WILKIE POINT Fmt.
BORDEN IS. Fmt.
ELLEF RINGNES IS.
ISACHSEN Fmt.
DEER BAY Fmt.
RINGNES Fmt.
JAEGAR Fmt.
SAVIK Fmt.
BORDEN IS. Fmt.
AXEL HEIBERG IS.
ISACHSEN Fmt.
DEER BAY Fmt.
AWINGAK Fmt.
SAVIK Fmt.
ELLESMERE IS.
DEER BAY Fmt.
AWINGAK Fmt.
SAVIK Fmt.
JAEGAR
SAVIK Fmt.
BORDEN IS. Fmt.

FIGURE 2: TABLE of FORMATIONS, ARCTIC NORTH AMERICA

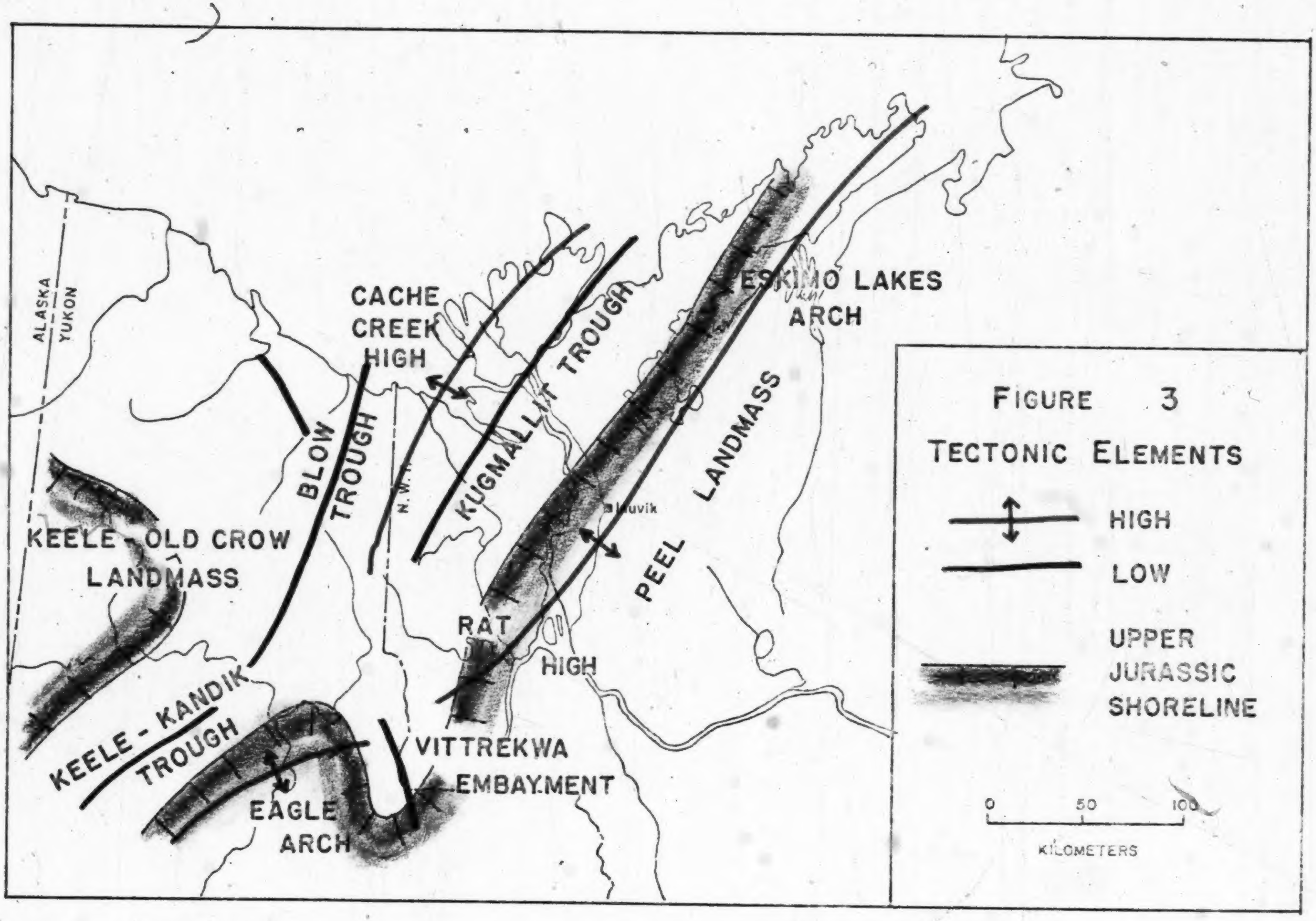


FIGURE 3

TECTONIC ELEMENTS

HIGH
LOW
UPPER JURASSIC SHORELINE
0
50
100
KILOMETERS
ALASKA
YUKON
N.W.T.
KEELE - OLD CROW LANDMASS
KEELE - KANDIK TROUGH
BLOW TROUGH
CACHE CREEK HIGH
KUGMALLIT TROUGH
ESKIMO LAKES ARCH
PEEL LANDMASS
Inuvik
RAT HIGH
VITTREKWA EMBAYMENT
EAGLE ARCH

Arch (Young, 1975) - located in the northern Eagle Plain - formed a northeasterly trending culmination bordering the northwest side of the Keele-Kandik Trough.

The Peel Landmass (Jeletzky, 1975) was a broad region of exposed northern interior platform during much of Jurassic time. Components of this landmass included the Eagle Arch, Rat Uplift, and the Eskimo Lakes Arch. These elements, together with the Cache Creek High constitute the so-called Aklavik Arch Complex (Jeletzky, 1961, 1975; Norris, 1974; Yorath and Norris, 1975) which has a history of tectonic activity dating back to the Proterozoic. The Vittrekwa Embayment represents a north-south trending reentrant in the southern portion of the Peel Landmass.

The nature and tectonic significance of the so-called Kaltag-Blow Fault Zone (Figure 4) are as yet poorly understood. It is believed, however, to be a northerly extension of the Kaltag Fault of Alaska and to have greatly affected Late Jurassic and Early Cretaceous sedimentation.

Regional Stratigraphy

In the western portions of the northern Yukon, most of the Jurassic System is represented by the dark grey and black marine shales of the Kingak Formation (Detterman _et_. _al_., 1975). Eastward from the Blow and Driftwood Rivers, the Kingak progressively changes facies first to siltstones and subsequently to sandstones of the Lower and Middle Jurassic Bug Creek Formation. Silty equivalents of the Bug Creek sands are known to occur in the subsurface of the Mackenzie Delta, and have been tentatively assigned to the Husky Formation (Young _et_. _al_., 1976, p. 12).

Upper Jurassic sediments include the Husky Formation (marine shale, siltstone and minor sandstone) in the eastern half of the region; the (open marine) Kingak shales in the western portions; and the marine to non-marine arenites of the Porcupine River Formation in the south and southwest. In the southeast, within the Vittrekwa Embayment, the Husky Formation becomes increasingly arenaceous and changes facies laterally into the conglomeratic and coaly North Branch Formation. Figure 4 shows the distribution of Upper Jurassic sediments in the north Yukon - Mackenzie Delta area.

Depositional History

In Early Jurassic (Hettangian to Sinemurian) time, a marine trangression - probably moving from northwest to southeast - progressively inundated the north Yukon area. By mid Jurassic this led to the opening of the Keele - Kandik Trough (Figures 3, 4) which linked the Beaufort - Mackenzie Basin with the Kandik Basin of east-central Alaska.

A pattern of sediment distribution became established in the early phases of this transgression that was not altered until Late Jurassic time. Quartz arenites of the Bug Creek Formation were deposited on the southeastern edge of the basin, along the flank of the Peel Landmass, and were dispersed northward into the region of the present day Richardson Mountains. Moving seaward, these sands passed laterally into siltstones of what has been called the "Arenaceous Facies" of the Kingak Formation (Jeletzky, 1972, 1975). West of Rapid Creek, black, marine shales of the Kingak Formation (sensu stricto) replace these siltstones, and continue westwards into northern Alaska.

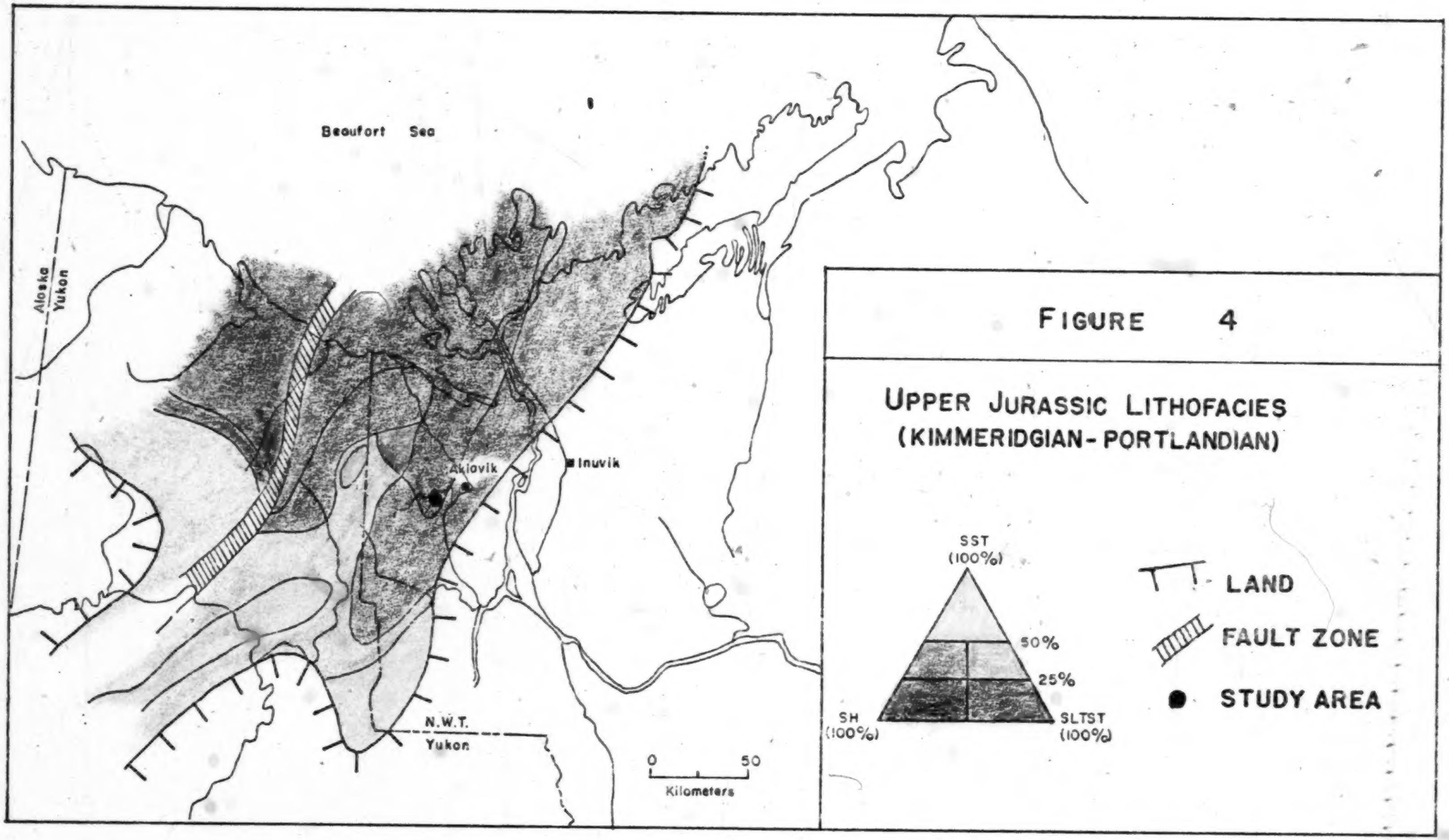

Beaufort Sea
Alaska
Yukon
Aklavik
Inuvik
N.W.T.
Yukon
0
50
Kilometers
SST (100%)
50%
25%
SH (100%)
SLTST (100%)
LAND
FAULT ZONE
STUDY AREA

FIGURE 4

UPPER JURASSIC LITHOFACIES (KIMMERIDGIAN-PORTLANDIAN)

Transgression continued in Late Jurassic time, causing the shoreline to migrate further southeastward. Lithofacies deposited during this time are similar to those of the Lower and Middle Jurassic, but their spatial distribution is different (Figure 4). Coarse, immature clastics of the North Branch Formation were deposited in the Vittrekwa Embayment. A thick succession of non-marine and marine sandstone (Porcupine River Formation) was deposited in the northeast end of the Keele - Kandik Trough and along the flanks of the Keele - Old Crow Landmass. Sand was also dispersed northward over the area of the present day northern Richardson Mountains and deposited as sand waves and offshore bars in an otherwise mudstone-shale facies (Lower and Arenaceous Members, Husky Formation) (Young _et_. _al_., 1976, p. 15). This depositional pattern was maintained until latest Jurassic or earliest Cretaceous time, when an eastward transgression of the sea blanketed the area with marine shales (Red Weathering Shale Member, Husky Formation). In the offshore areas, marine shales of the Kingak Formation continued to be deposited throughout Late Jurassic time.

Progressive shallowing and shoaling of the sea accompanied by local uplift characterized deposition during early and mid Berriasian (Upper Member, Husky Formation) time. Sediments exhibit a coarsening upwards trend, which culminated in the deposition of the Buff Sandstone Member of the Lower Sandstone Division.

The Husky Formation, Aklavik Range, District of Mackenzie, N. W. T.

Jeletzky (1967) first proposed the name Husky Formation for a thick succession of recessively weathering Upper Jurassic to basal Cretaceous (mid Berriasian) shales, siltstones and sandstones, which overlie the Bug Creek Formation sandstones. He designated the Aklavik Range - Martin Creek region of the northern Richardson Mountains as the area of "typical development" of this unit. The type section is located along Husky Creek, eight kilometers north of Mount Goodenough. There the formation is some 350 m thick, though incomplete because of faulting. Indeed, all other sections of the Husky Formation examined by Jeletzky in the Aklavik Range are incomplete because of this or because of other structural complications.

The Husky Formation is divisible into four informal members, which are, in descending order:

UPPER MEMBER (early to mid Berriasian)
RED WEATHERING SHALE MEMBER (early Berriasian)
ARENACEOUS MEMBER (Upper Tithonian)
LOWER MEMBER (Oxfordian to Portlandian)

The Jurassic Cretaceous boundary occurs within the Husky Formation, and is placed, on faunal evidence, at the base of (or within) the Red Weathering Shale Member. Lithologically, the four members are fairly distinctive, though paleontologic control is necessary for positive identification.

The Lower Member is the thickest of the four members of the Husky Formation and ranges in thickness from 227 to 245 m. Although the Husky Formation was originally (informally) termed the Lower Shale Siltstone Division (Jeletzky, 1958, 1960) the only "true" (i.e. pure) shales occur within the basal third of the Lower Member and throughout the Red Weathering Shale Member (Jeletzky, 1967, p. 30, 33; Young _et. al_., 1976, p. 11). In the Aklavik Range, this basal interval of the Lower Member is characterized by numerous layers of rusty weathering loaf and cannonball shaped clay ironstone concretions. In one particular horizon (82 m above base in the type section), these concretions reach huge dimensions - up to five meters in diameter (Jeletzky, op. cit., p. 99, also Plate VIII, Figure 1). Similar "mega-concretions" also occurs within strata of coeval age (Oxfordian to Portlandian) in the Ringnes Formation shales of the Sverdrup Basin, Canadian Arctic Archipelago (Balkwill, Wilson and Wall, 1977). The remaining two-thirds of the Lower Member, while retaining their shaly nature, contain numerous interbeds of silty shale, siltstone, and rarer fine-grained sandstone. Coquinas composed of Buchia shells are common in the upper half of this unit.

At Martin Creek, the Lower Member is 208 + m thick (see Appendix A). The contact with the arenites of the underlying Bug Creek Formation (see Frontispiece) is very sharp, with dark grey, sulphurous Husky shales resting directly on Bug Creek sands. No evidence of a basal conglomerate or grit was seen. The concretionary horizons, so evident in the basal portion of the Lower Member in the Aklavik Range, are not well developed here. A discontinuous layer of "mega-concretions" similar to those found in the Aklavik Range occurs approximately 36 m above the base (Plate 1B). The upper portions of the Lower Member (Plates 1A, 2A) contain increasingly abundant interbeds of hard, silty shale, siltstone, and some fine-grained quartz sandstone. Four coarsening upward cycles [consisting of a progression of shale - siltstone - sandstone (sometimes carbonaceous or with thin coaly stringers)] one to 4 m thick are developed in the mid-portion of the member (Plates 1A, 2A, B). These form excellent local horizon markers. Near the top of the succession (152 to 175 m above base) there is developed a sequence of interbedded siltstone, silty sandstone, and fine-grained thin- to medium-bedded, cross-bedded quartzose sandstones. Although originally thought to represent the Arenaceous Member (Brideaux and Fisher, 1976; Brideaux, 1976), they carry a Buchia fauna of Portlandian age (see Appendix B). Thus this sand body could probably be termed a ?tongue of the Porcupine River Formation (or it's lateral equivalent). These five coarsening-upwards successions may be examples of what Young et. al. (1976, p. 13, 15) have interpreted as sand waves or offshore bar developments in the Lower Member of the Husky Formation.

The Arenaceous Member consists of coarser clastics than the underlying Lower Member, and is normally capped by distinctive, richly glauconitic sandstone. This glauconite-rich horizon shows up consistently in cuttings recovered from boreholes in the southern Mackenzie Delta area that parallel the trend of the Kugmallit Trough. It makes an excellent subsurface marker unit that approximates latest Jurassic time (Young et. al., op. cit., Figure 6).

The Red Weathering Shale Member - as already noted above - consists of pure, rusty weathering marine shale, with numerous horizons of similarly weathering clay ironstone concretions. It marks a phase of uppermost Jurassic and/or basal Cretaceous marine transgression. In the Aklavik Range it is typically 15 to 20 m thick. Like the Arenaceous Member, it was not seen on Martin Creek, and is presumed to be absent due to faulting.

In gross aspect, the Upper Member (generally 25 to 35 m thick) consists of one large ("mega") coarsening-upwards cycle: beginning with shales at the base and grading upwards to interbedded shales, siltstones and sandstones, and finally to the massive sandstones of the Buff Sandstone Member of the Lower Sandstone Division. At Martin Creek, the Upper Member is 42 + m thick. It contains a diagnostic early to mid Berriasian Buchia fauna, and a rich microplankton assemblage (Brideaux, 1976).

Biostratigraphic control is almost wholly dependent on the vertical succession of the pelecypod Buchia (Jeletzky, 1958, 1962, 1973; Brideaux and Fisher, 1976, Figure 12). This scheme is not nearly as refined as the standard northwest European ammonite zonation (e. g.: the Buchia mosquensis Zone - representing Middle and Upper Kimmeridgian and early Portlandian - is itself equivalent to nine northwest European ammonite zones), but considering the scarcity of ammonites, becomes the only alternative. Indeed, ammonites are so rare as to be impractical for local zonation and correlation.

CHAPTER III

BIOSTRATIGRAPHY

The prime objective of the study of the Husky Formation by the Geological Survey of Canada was to establish a "standard reference section" which would incorporate megapaleontological, micropaleontological and palynological zonal schemes. Unfortunately, since the section selected for detailed study has been shown to be faulted, only the zonation of the Lower Member of the Husky Formation is attempted.

I. Megafossil Zonation of the Lower Member of the Husky Formation at Martin Creek, N. W. T.

During the course of field work, fourteen lots of megafossils were collected from the Lower Member of the Husky Formation at Martin Creek to facilitate calibration of the section against internationally accepted zones. The majority of these suites were recovered from the more silty/sandy interbeds as (in marked contrast to the stratotype of the Lower Member in the adjacent Aklavik Range) horizons of clay ironstone concretions are rare (the clay ironstone concretions are normally very fossiliferous, and carry the major portion of the well preserved fauna). Although intervals of fossil hash (coquinoid beds) are present in the lower portion of the section, preservation is invariably very poor. These intervals were not sampled.

Representatives of the pelecypod genus Buchia constitute the only biostratigraphically useful fossils that occur in abundance throughout the Lower Member. These demonstrate (see Appendix B) the presence of late Oxfordian, Kimmeridgian and Portlandian strata in the section, but do not permit a concise zonation of the latter.

Figure 5 illustrates the megafossil-derived zonation of the Lower Member at Martin Creek. Only two zones are recognizable with certainty. The basal 160 meters of the section are placed in the Buchia (Anaucella) concentrica s. lato - Buchia mosquensis Zones (undiff.) of late Oxfordian - Kimmeridgian age. The fauna present includes: (All megafossil identifications, unless otherwise specified, are by Dr. J.A. Jeletzky)

Buchia (Anaucella) concentrica (Sowerby) s. lato
Buchia (Anaucella) concentrica (Sowerby) var. erringtoni
Buchia cf. mosquensis (von. Buch)
Camptonectes (Boreionectes) cf. B. praecinctus Spath
Cylindroteuthis (Cylindroteuthis) sp. indet.
"Turbo" ex. aff. "T." ferniensis Frebold
indeterminate pelecypods
phylloceratid ammonite, gen. et. sp. indet.

The remaining 50 meters of section are included in the Buchia piochii s. lato Zone of mid to late Portlandian age. The fauna includes:

Buchia piochii (Gabb) s. lato
Buchia cf. blandfordiana (Stoliczka)
Buchia cf. fischeriana (d'Orbigny)
"Aucellina" n. sp. ex. aff. "A." schmidti Sokolov 1912
indeterminate pelecypods

As can be clearly seen in Figure 5, the "basal" Portlandian sand corresponds to what was originally thought to be, on the basis of lithology, the Arenaceous Member of the Husky Formation.

In addition, one fragmentary ammonite was recovered in float approximately 8 m above the base of the section. Frebold has tenatively identified the form as Cardioceras s. lato, sp. indet.

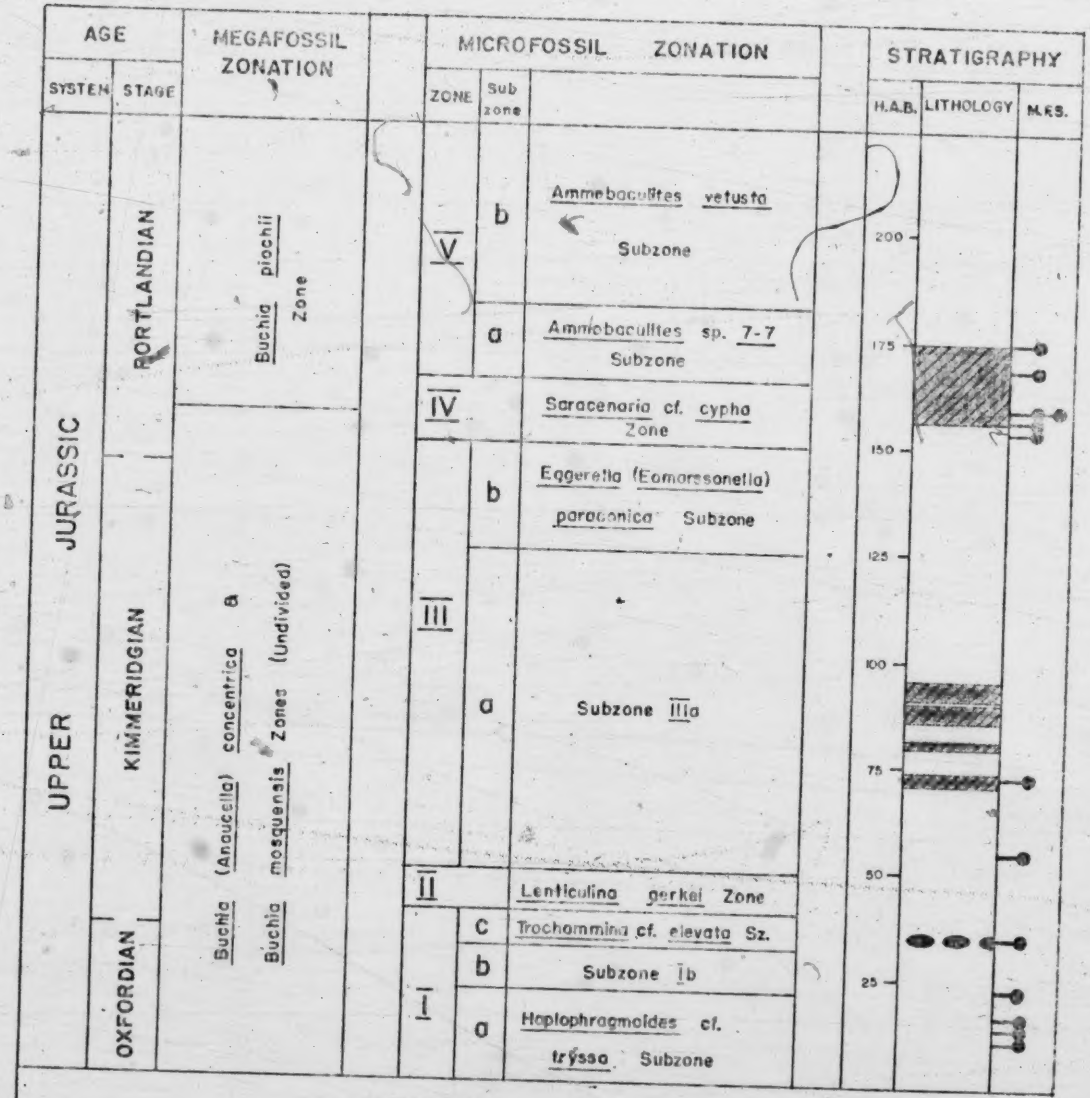

AGE
SYSTEM
STAGE
MEGAFOSSIL ZONATION
MICROFOSSIL ZONATION
ZONE
Sub zone
STRATIGRAPHY
H.A.B.
LITHOLOGY
M.F.S.
UPPER JURASSIC
PORTLANDIAN
KIMMERIDGIAN
OXFORDIAN
Buchia piochii Zone
Buchia (Anaucella) concentrica & Buchia mosquensis Zones (Undivided)
V
b
Ammobaculites vetusta Subzone
a
Ammobaculites sp. 7-7 Subzone
IV
Saracenaria cf. cypha Zone
III
b
Eggerella (Eomarssonella) paraconica Subzone
a
Subzone IIIa
II
Lenticulina gerkei Zone
I
c
Trochammina cf. elevata Sz.
b
Subzone Ib
a
Haplophragmoides cf. tryssa Subzone
200
175
150
125
100
75
50
25

FIGURE 5 MEGAFOSSIL and FORAMINIFERAL ZONATION OF THE LOWER MEMBER (HUSKY FMT.) AT MARTIN CREEK, N.W.T.

Erratum: Haplophragmoides cf. tryssa Subzone = Subzone Ia.

⬬ Concretionary Horizon

⊸● Megafossil Locality

▨ Sandstone or Siltstone

☐ Shale

This genus is regarded as a diagnostic zone fossil for the Lower Oxfordian. Thus it is probable that at least some of the basal beds of the Lower Member are early Oxfordian in age. Since the ammonite was not found _in situ_ however, it has been omitted from the above zonation, although it s presence is recorded herein.

II. Foraminiferal Zonation of the Lower Member of the Husky Formation at Martin Creek, N. W. T.

The prime objective of the present study is the systematic description of Upper Jurassic (Oxfordian to Portlandian) Foraminifera from the Lower Member of the Husky Formation, in order to create a prime reference outcrop section. No additional sections or wells have been appended. Therefore, a series of informal assemblage zones are proposed which refine the rather coarse twofold zonation provided by megafossils. Five zones and nine subzones (three unamed) for the Lower Member of the Husky Formation are recognized and described below.

Three categories are employed to define the relative biostratigraphic merits of the foraminiferal species, namely: "background noise", "stopper" and "zonal". The former (rather unflattering) term refers to those long-ranging, successful forms (i.e. _Cribrostomoides goodenoughensis_ (Chamney), _Reophax minuta_ Tappan) that occur throughout the section, and thus contribute little to biostratigraphic refinement. The latter two categories have more meaning as they possess definite vertical ranges, and can thus be used to delineate zones. The usage of the terms follows that of Souaya (1976). Thus a "stopper" is a form whose range ends in a particular zone, whereas a "zonal" is a form whose range is restricted to that zone. In the oldest assemblage zone of any particular section, the two terms appear to be synonomous.

Zone I - "Haplophragmoides cf. tryssa" fauna

The "Haplophragmoides cf. tryssa" Zone is of approximately late Oxfordian age, and encompasses the basal 39 meters of the Lower Member. The fauna is dominated by arenaceous foraminifera, which usually constitute 80% to 90% of any given suite. Three faunules or subzones can be distinguished, of which the lower and upper (Subzones Ia and Ic) contain distinctive forms. The middle subzone (Subzone Ib) can only be recognized by stoppers.

Subzone Ia

Subzone Ia occupies the basal 20 meters of shale overlying the quartz arenites of the Bug Creek Formation. Diagnostic forms restricted to this unit are:

Ammodiscus sp. cf. A. silicea (Terquem)
?Lituotuba sp. 5-5
Glomospira sp. cf. G. glomerosa Eicher
G. sp. cf. G. tortuosa Eicher
Ammobaculites alaskensis Tappan (restr) subsp. 5-5
A. sp. 5-9
A. sp. 5-13
Haplophragmium sp. 5-9
H. sp. 5-13
Recurvoides sp. 5-4 (=Recurvoides gryci (Tappan) Dain)
Trochammina kosyrevae Levina
T. sp. cf. T. rostovzevi Levina
T. sp. 29109
Verneuilinoides sp. cf. V. postgraciosus Kommissarenko

Other, longer ranging froms that also constitute a major portion of this fauna include: *Ammodiscus* sp. cf. *A. orbis* Lalicker, *Haplophragmoides* sp. cf. *H. tryssa* Loeblich and Tappan, *Trochammina omskensis* Kosyreva, *T.* sp. *5-13*, *T.* sp. *5-27* and *Verneuilinoides* sp. cf. *V. graciosus* Kosyreva.

Calcareous foraminifers are almost totally absent, and those present are preserved as steinkerns.

Subzone Ib.

Subzone 1b is 13 m thick and lies below the distinctive fauna of Subzone 1c. The lower boundary with Subzone 1a is less clear, such that the two subzones could perhaps be merged into one. This subzone contains no "zonal" foraminifers, but includes the stoppers:

Haplophragmium pokrovkaensis Dain
Trochammina omskensis Kosyreva
T. sp. *5-13*

Subzone Ic. [*Trochammina* sp. cf. *elevata* fauna]

This physically small (6 m thick) faunule occupies the uppermost portion of Zone 1. Spatially it coincides with the "zone of megaconcretions", which form a good regional marker within the Lower Member. It's base is characterized by the first mass, flood-like appearence of *Trochammina* sp. cf. *T. elevata* Dain and the (?)simultaneous disappearence of *Trochammina omskensis* Kosyreva and *T.* sp. *5-13*. Other forms also suddenly appearing in large numbers are:

Trochammina sp. *5-25*
T. sp. *5-27*
?*Ammosphaeroidina* sp. *5-23*
Verneuilinoides sp. cf. *V. graciosus* Kosyreva
Conorboides sp. *5-29*

Ceratocancris sp. cf. C. ambitiosus Dain

While the latter forms are not restricted to this subzone, they are not present elsewhere in such large numbers. Exceptionally preserved examples of Cribrostomoides goodenoughensis (Chamney), C. canui (Cushman) and Evolutinella sp. 5-25 occur throughout. Calcareous forms - other than polymorphinids - make their first substantial appearance in the Trochammina cf. elevata Subzone.

Zone II [Lenticulina gerkei fauna]

The Lenticulina gerkei Zone is of late Oxfordian to ?early Kimmeridgian age, and extends from 39 to 50 meters above the base of the Lower Member. The unit is characterized by the sudden influx of a distinctive calcareous-walled foraminiferal fauna dominated by nodosariids and the almost instantaneous disappearance of Trochammina sp. cf. T. elevata Dain. Although the calcareous forms never constitute more than 33% of the total population of any given suite, they are on both the generic and the specific level a very diverse group. The corresponding arenaceous populations exhibit a marked diminution in both numbers and diversity. The upper boundary is marked by the disappearance of the calcareous fauna, and the occurrence of the distinctive arenaceous foraminifer Arenoturrispirillina intermedia Chamney. Diagnostic forms within this Zone include:

Zonals: Arenoturrispirillina intermedia Chamney
Citharina sp. 5-29
C. sp. 5-32
Dentalina sp. 5-30
D. sp. 5-31
Lenticulina gerkei Dain

L. sp. cf. L. audax Loeblich and Tappan

L. sp. 5-29B

L. sp. 5-32

Marginulina sp. cf. M. brevis Paalzow

Nodosaria orthostoecha Loeblich and Tappan

N. sp. 5-28

N. sp. cf. N. amphigya Loeblich and Tappan

Saracenaria phaedra Tappan

Stoppers: Verneuilinoides sp. cf. V. graciosus Dain

Conorboides sp. 5-29

Ceratocancris sp. cf. C. ambitiosus Dain

Zone III

Zone III occupies some 50% of the Lower Member, and spans about 100 m of section. The unit is of a general Late Oxfordian to Kimmeridgian age; though perhaps more so the latter than the former. It is divisible into two subzones, IIIa and IIIb.

Subzone IIIa

Subzone IIIa spans the basal 80 meters of Zone III. The sediments here are predominantly shales, interbedded with subordinate amounts of siltstone and fine grained sandstone. Four coarsening-upwards cycles occur within this unit and constitute the "four silty bands" used as local marker horizons on Martin Creek (Plate 1A; Plate 2A, B).

The foraminiferal fauna is predominantly agglutinated in nature, with calcareous forms commonly occupying 10% or less of any given suite. Diagnostic zonals are all but lacking, and only the presence of several stoppers serves to make the unit distinctive. The fauna is characterized by:

Zonals: Astacolus sp. cf. A. praesibirensis Dain (single suite)

Stoppers: Ammodiscus sp. cf. A. francisi (Wall)
Cribrostomoides sp. cf. C. mirandus Dain
Evolutinella sp. 5-25
Recurvoides canningensis (Tappan)
?Ammosphaeroidina sp. 5-23

Subzone IIIb. [Eggerella (Eomarssonella) paraconica fauna]

The Eggerella (Eomarssonella) paraconica fauna, which characterizes Subzone IIIb occupies the upper 20 m of Zone III and is of probable latest Kimmeridgian age. It occurs in rather soft, silty shales which grade upsection into interbedded siltstones and sandstones carrying a diagnostic Portlandian pelecypod fauna.

As in Subzone IIIa, the fauna is completely dominated by arenaceous foraminifers, which constitute more than 90% of the total population of any given suite. The calcareous forms present are preserved as either fragments or steinkerns. The base of the subzone is delineated by the abundant occurrence of "Tolypammina" sp. 6-11, while the top is marked by a general reduction in numbers and diversity of arenaceous foraminifers with the introduction of the predominantly calcareous elements of the overlying Zone IV fauna. Subzone IIIb contains the following diagnostic fauna:

Zonals: "Tolypammina" sp. 6-11
Trochamminoides sp. 6-13
Eggerella (Eomarssonella) paraconica Dain
Orientalia sp. 6-17 and var.

Other, longer ranging (i.e. non-stopper) forms that commonly occur within this Subzone include:

Ammodiscus sp. cf. A. orbis Lalicker
Recurvoides sp. 5-11
Trochammina sp. 7-13B
Verneuilina sp. cf. V. anglica Cushman

Zone IV. [Saracenaria sp. cf. S. cypha fauna]

The Saracenaria sp. cf. S. cypha fauna characterizes Zone IV and occurs in interbedded fine-grained sandstones, siltstones and shales of mid to late Portlandian age. The unit is 15 m thick and occurs 149 to 164 m above the base of the Lower Member.

Zone IV contains the largest numbers of calcareous foraminifers encountered anywhere in the Lower Member. Most suites contain between 30% and 50% calcareous elements, with at least one exceptional suite carrying over 65%. The calcareous forms differ on the specific and, to some extent, on the generic level from those found in the older Lenticulina gerkei fauna of Zone II. Only Geinitzinita praenodulosa Dain and Pseudonodosaria brandi (Tappan) were found to be common to both zones. Both the numbers and diversity of arenaceous foraminifers occurring in Zone IV are very much lower than in adjacent, arenaceous-dominated suites. The fauna of Zone IV consists of:

Zonals: Astacolus sp. 6-16
Lenticulina sp. 7-3
Marginulinopsis sp. 6-21 (=?M. jonesi (Reuss))
Planularia sp. 7-3
Pseudonodosaria sp. 7-1
Saracenaria sp. cf. S. cypha Loeblich and Tappan
S. sp. 7-3
Vaginulinopsis sp. 6-10

V. sp. cf. V. enodis Loeblich and Tappan

V. sp. 7-3

Pseudolamarckina(?) sp. cf. P. liapensis Dain

The zone also contains the first appearance of Saccammina sp. cf. S. lathrami Tappan.

Zone V

Zone V, the youngest fauna present in the Lower Member at Martin Creek, is of mid to late Portlandian (or younger) age. It is 44 + m (top not seen) thick and comprises interbedded siltstones and shales at the base, grading to fairly soft, silty to sandy shales in its middle and upper portions.

The foraminiferal fauna is characterized by the increasing dominance of arenaceous foraminifers upsection, such that some of the uppermost suites contain no calcareous forms at all. A second noticeable trend is in the change in relative abundance of Cribrostomoides and Ammobaculites. For the first time in the Lower Member, the latter genus appreciably outnumbers the former. Zone V is divisible into two subzones, Va and Vb, which are described below.

Subzone Va. [Ammobaculites sp. 7-7 fauna]

The subzone of Ammobaculites sp. 7-7 comprises 15 m of interbedded silty shales and siltstones carrying the mid to late Portlandian Buchia piochii fauna. Its base is drawn at the first extensive occurrence of Ammobaculites sp. 7-7, which coincides with the disappearence of the calcareous fauna of Zone IV. The top possesses a very distinctive, short-ranging fauna reminiscent (in part) of the older Eggerella (Eomarssonella) paraconica fauna of Subzone IIIb. The fauna present includes:

Zonals: *Ammobaculites* sp. *7-7*
Ammobaculoides sp. *7-13*
Trochammina sp. *7-13A*
Verneuilina sp. *A*
Verneuilinoides sp. *A*
Eggerella (*Eomarssonella*) sp. cf. *E*.(*E*.) *paraconica* Levina.
Orientalia sp. *7-13*

Other, longer-ranging species that are important members of this fauna include :

Saccamina sp. cf. *S*. *lathrami* Tappan
Reophax sp. cf. *R*. *adaptatus* Dain
Ammobaculites *alaskensis* Tappan (restr.)
A. *multiformis* Dain
Trochammina sp. *7-13B*
Verneuilina sp. cf. *V*. *anglica* Cushman

Subzone Vb. [*Ammobaculites* sp. *7-24* fauna]

Subzone Vb, characterized by the *Ammobaculites* sp. *7-24* fauna is the youngest zone present in the Lower Member at Martin Creek. It occurs in soft, rather silty shales that are some 30 + m thick; and is of mid to late Portlandian (or younger) age.

The fauna is strongly dominated by arenaceous forms, often to the exclusion of any calcareous elements. Where present the latter occur either as fragments or as steinkerns. The fauna includes:

Zonals: *Ammobaculites* sp. *7-24*
A. sp. *7-10*
Recurvoides sp. *7-23*
Ammobaculoides sp. *7-18*

Trochammina sp. 7-20

T. sp. 7-21

Other, longer ranging faunal elements include:

Bathysiphon sp.

Reophax sp. cf. R. adaptatus Dain

Ammobaculites alaskensis Tappan (restr.)

A. multiformis Dain

Trochammina sp. 7-13 B

Verneuilina sp. cf. V. anglica Cushman

III. Regional and Intercontinental Correlation of Microfaunas

The affinities of the Upper Jurassic microfauna from the Aklavik Range, District of Mackenzie, Northwest Territories are compared for selected regions of the northern hemisphere where coeval assemblages occur. The relative affinities of foraminiferal faunas from Alaska, the Canadian Arctic Archipelago, the Western Interior of North America, the Grand Banks of Newfoundland, northwestern Europe, Siberia and Martin Creek are summarized in Figure 6. Figures 7 and 8 illustrate a comparison of the microfaunas on a generic level.

Alaska

The only published study of the Jurassic Foraminifera of Alaska is Tappan's (1955) pioneering work on the microfaunas of the north slope. About two-thirds of the forms described by her were assigned either Lower or Middle Jurassic ages. In the Upper Jurassic, utilizing both core and surface samples, Tappan recovered:

Bathysiphon anomalocoelis Tappan

*Glomospira pattoni Tappan [= G. sp. cf. G. glomerosa Eicher]

*Ammodiscus cheradospirus Loeblich and Tappan

FIGURE 6 COMPARISON OF MARTIN CREEK MICROFAUNAS WITH OTHER REGIONS OF THE NORTHERN HEMISPHERE

REGION \ AFFINITY	VERY STRONG	STRONG	MODERATE	LOW	VERY LOW
SVERDRUP BASIN, N.W.T. SOUAYA, 1976; BALKWILL, WILSON, and WALL, 1977.		●			
NORTHERN ALASKA TAPPAN, 1955.		●			
WESTERN INTERIOR LOEBLICH & TAPPAN, 1950a,b; WALL, 1960; BROOKE & BRAUN, 1972.				●	
ATLANTIC COAST GRADSTEIN, 1977					●
NORTHWEST EUROPE GORDON, 1961, 1965; BIELECKA and POZARYNSKI, 1954.				●	
WESTERN SIBERIA DAIN et. al. 1972.	●				

FIGURE 7

OCCURENCE OF ARENACEOUS FORAMINIFERS IN SELECTED AREAS OF THE NORTHERN HEMISPHERE

		BATHYSIPHON	LITUOTUBA	SACCAMMINA	AMMODISCUS	GLOMOSPIRA	GLOMOSPIRELLA	TOLYPAMMINA	"TOLYPAMMINELLA"	ARENOTURRISPIRILLINA	TURRITELLELLA	MILIAMMINA	REOPHAX	HAPLOPHRAGMOIDES	CRIBROSTOMOIDES	RECURVOIDES	TROCHAMMINOIDES	AMMOBACULITES	HAPLOPHRAGMIUM	TRIPLASIA	AMMOMARGINULINA	FLABELLAMMINA	TROCHAMMINA	AMMOSPHAEROIDINA	AMMOBACULOIDES	SPIROPLECTAMMINA	TEXTULARIA	SIPHOTEXTULARIA	PSEUDOBOLIVINA	GAUDRYINA	DOROTHIA	VERNEUILINA	VERNEUILINOIDES	EGGERELLA (EOMARSSONELLA)	ORIENTALIA
MARTIN CREEK, N.W.T.	(THIS STUDY)	●	●	●	●	●	●		●	●	●		●	●	●	●	●	●	●				●	●	●	●	●	●	●			●	●	●	●
NORTH SLOPE, ALASKA	(TAPPAN, 1955)	●		●	●	●									●	●		●					●			●				●					
SVERDRUP BASIN	(SOUAYA, 1976)	●		●	●	●				●			●	●	●	●		●			●	●	●							●		●		●	
	(BALKWILL et al., 1977)	●	●	●	●					●			●	●	●	●		●	●				●		●	●					●	●	●	●	
WESTERN INTERIOR	(WALL, 1960; B.&S., 1972)	●	●	●	●	●					●		●	●				●		●	●	●	●								●		●		
	(L. & T., 1950a, b)				●								●	●				●					●										●		
GRAND BANKS, NFLD.	(GRADSTEIN, 1977)													●				●					●							●					
NORTHWEST EUROPE	(GORDON, 1961, 1965)			●									●	●	●			●					●			●	●			●		●			
	(BIELECKA et. al., 1954)													●				●		●		●													
WESTERN SIBERIA	(DAIN et. al., 1972)		●		●	●	●	●				●	●	●	●	●		●	●				●	●		●					●		●	●	●

FIGURE 8
OCCURENCE OF CALCAREOUS FORAMINIFERS IN SELECTED AREAS OF THE NORTHERN HEMISPHERE

	MARTIN CREEK, N.W.T. (THIS STUDY)	NORTH SLOPE, ALASKA (TAPPAN, 1955)	SVERDRUP BASIN (SOUAYA, 1976)	SVERDRUP BASIN (BALKWILL et al., 1977)	WESTERN INTERIOR (HALL, 1960; B.&S., 1972)	WESTERN INTERIOR (L.B.T., 1980-83)	GRAND BANKS, NFLD. (GRADSTEIN, 1977)	NORTHWEST EUROPE (GORDON, 1961, '65)	NORTHWEST EUROPE (BIELECKA et al., 1980)	WESTERN SIBERIA (DAIN et al., 1972)
SPIRILLINA	●				●	●	●		●	
OPTHALMIDIUM					●		●	●		
QUINQUELOCULINA					●					
ASTACOLUS	●			●	●	●				●
CITHARINA	●				●	●		●		
CITHARINELLA	●				●	●				
DARBYELLA		●								
DENTALINA	●	●		●	●	●		●	●	●
FALSOPALMULA						●		●		
FRONDICULARIA		●			●	●		●	●	
GEINITZINITA	●			●						●
ICHTYOLARIA	●									●
MARGINULINA	●	●			●	●	●	●	●	●
MARGINULINOPSIS	●	●		●	●	●				●
NODOSARIA	●	●	●	●	●	●		●	●	●
PALMULA				●	●					
PLANULARIA	●							●	●	●
PSEUDONODOSARIA	●	●								●
SARACENARIA	●	●		●	●	●		●	●	●
TRIBRACHIA					●					
TRISTIX	●				●	●		●	●	
VAGINULINA					●	●		●	●	
VAGINULINOPSIS	●				●	●				●
LAGENA		●						●		
ENANTIOMORPHA										●
EOGUTTULINA	●			●	●	●		●	●	●
GLANDULOPLEUROSTOMELLA										●
GLOBULINA	●	●	●	●						●
GUTTULINA	●		●		●	●			●	●
OOLINA										
PALEOPOLYMORPHINA						●				
PARADENTALINA										●
PSEUDOGLANDULINA						●		●	●	
CONICOSPIRILLINA										●
TROCHOLINA									●	●
TROCHOSPIRILLINA										●
TURRISPIRILLINA										●
CERATOBULIMINA										●
CERATOCANCRIS	●			●						●
CONORBOIDES	●			●	●				●	
HOEGLUNDINA								●		
PSEUDOLAMARCKINA	●									●
BROETZENIA								●		
EPISTOMINA							●		●	
PSEUDOCYCLAMMINA							●		●	
VOORTHUYSENIA								●		
LENTICULINA	●	●	●	●	●	●	●	●	●	●
LINGULINA					●	●		●	●	

**Ammodiscus orbis* Lalicker

**Haplophragmoides canui* Cushman

**Ammobaculites alaskensis* Tappan

Spiroplectammina sp.

Gaudryina leffingwelli Tappan

G. milleri Tappan

G. topagorukensis Tappan

**Trochammina canningensis* Tappan

T. topagorukensis Tappan

T. gryci Tappan

Darbyella volgensis Tappan

Lenticulina wisniowskii (Myatliuk)

Saracenaria oxfordiana Tappan

**S. phaedra* Tappan

S. topagorukensis Tappan

Marginulinopsis phragmites Loeblich and Tappan

**Marginulina brevis* Paalzow

M. pinguicula Tappan

**Rectoglandulina brandi* Tappan

Dentalina ectadia Loeblich and Tappan

**Frondicularia* sp. [=? *Geinitzinita praenodulosa* Dain]

Lagena liassica (Kubler and Zwingli)

Globulina topagorukensis Tappan

Nodosaria detruncata Schwager

Somewhat less than half (both arenaceous and calcareous) of Tappan's designated Upper Jurassic species - or forms comprable to them - are found in the Lower Member of the Husky Formation, and are designated in the above faunal list with an asterisk. Other species, described by Tappan as being diagnostic of (or at least found only in) Early or Middle Jurassic age, but also found in the Lower Member include;

Reophax suevica Franke

R. metensis Franke

Ammodiscus siliceus Terquem

Ammobaculites vetusta (Terquem and Berthelin)

Textularia areoplecta Tappan

Marginulina breviformis (Terquem and Berthelin)

Rectoglandulina quinquecostata (Bornemann)

Remarkable in their absence are the arenaceous genera *Arenoturrispirillina*, "*Tolypammina*", *Recurvoides*, and the *Eggerella* (*Eomarssonella*) - *Orientalia* group, which occur elsewhere in the northern boreal microfaunas.

Detterman *et*. *al*. (1975) have commented on the fact that at least some of Tappan's species are much longer ranging than had previously been supposed. They concluded that a major reappraisal of Jurassic microfaunas was in order, and no further discussion of this will be made at the present time. Although the faunas bear many common elements (more so on the genus than on the species level), it is felt that a restudy of the Alaskan material initially described by Tappan would demonstrate that the microfaunas are much more closely allied than can presently be proven.

Sverdrup Basin, Canadian Arctic Archipelago

Published material on the Jurassic microfaunas of this vast geographic region is scarce. Other than microfossil checklists (Balkwill, Wilson, and Wall, 1977), Souaya's (1976) "catalogue of Mesozoic foraminifers" from the Sun-Gulf-Global Linckens Island P-46 well is the only illustrated study available. Its usefulness is somewhat handicapped by a lack of detailed systematics, and the fact that samples were obtained from cuttings rather than core. (Note: Not all the foraminifers discussed below are recognized by the same taxonomic designations that Souaya employed. Where the writer's opinion is at variance with the latter's, the name used in this study is cited in square brackets).

Souaya (1976) subdivides the Upper Jurassic into the Oxfordian, Kimmeridgian and Tithonian stages. Inasmuch as the section is located in the "Boreal" faunal realm, it is not clear why the term Tithonian (a "Tethyan" Upper Jurassic stage) is preferred to Portlandian. Moreover, in the "Boreal" realm, many authorities still favour the Portlandian and Upper Tithonian (or Upper Volgian) as stage names to designate the period Souaya terms Tithonian. It is assumed therefore, that the Portlandian stage is approximately equivalent to the basal portion of Souaya's Tithonian.

The Upper Jurassic in the Lincken's Island P-46 well was subdivided by Souaya into three zones and six subzones, none of which are readily identifiable at Martin Creek. The general faunas are quite similar however. Of the forty-eight species of foraminifers recovered from the designated Upper Jurassic interval in the Linckens Island well, the following species are comparable with forms found at Martin Creek:

Bathysiphon vitta Nauss [= Bathysiphon sp.]
Saccammina lathrami Tappan

S. sp. cf. S. franconica Ziegler [=Saccammina sp. 5-10]
Ammodiscus orbis Lalicker
A. sp. cf. A. cheradospirus Loeblich and Tappan
A. sp. cf. A. siliceus (Terquem)
Arenoturrispirillina intermedia Chamney
Glomospira pattoni Tappan [= partim G. sp. cf. G. glomerosa Eicher]
Reophax suevicus Franke
R. sp. cf. R. metensis Franke [= R. metensis Franke]
Haplophragmoides sp. cf. H. tryssa Loeblich and Tappan [= ?Cribrostomoides mirandus Dain]
Recurvoides disputabilis Dain (both subspecies)
Ammobaculites alaskensis Tappan
A. venustus Loeblich and Tappan
Trochammina topagorukensis Tappan [= T. sp. cf. T. elevata Dain]
Verneuilina anglica Cushman
Verneuilinoides sp. cf. V. georgiae(Terquem) [= Eggerella (Eomarssonella) sp. cf. E. (E.) paraconica Levina]

In addition to the above "Upper Jurassic" fauna, the following forms were also recognized in the Lower Member. Their age assignments - from the P-46 well - are noted in parentheses.

Reophax sp. B (Triassic) [= R. minuta Tappan]
Ammobaculites sp. A (Late Callovian) [= A. sp. 5-36]
Haplophragmoides goodenoughensis Chamney (Tithonian to Valanginian) [= Cribrostomoides goodenoughensis (Chamney)]

Trochammina globigeriniformis (Parker) (Berriasian to Valanginian) [= ?*T*. sp. cf. *T*. *elevata* Dain subsp. *A*]
T. sp. cf. *T*. *exigua* Cushman and Applin (Berriasian to Valanginian) [= *T*. sp. *7-13A*]
Dentalina sp. cf. *D*. *communis* d'Orbigny (Valanginian)
Frondicularia tumida? (Terquem) (Berriasian) [= ?*Geinitzinita praenodulosa* Dain]
Lenticulina audax Loeblich and Tappan (Bathonian-Callovian]
Lingulina sp. cf. *L*. *hybrida* Frentzen (Berriasian-Valanginian) [= *Geinitzinita praenodulosa* Dain]
Marginulina breviformis (Terquem and Berthelin) (Callovian)
M. *dentaliniformis* (Terquem and Berthelin) (Callovian)
Pseudonodosaria brandi (Tappan) (Bathonian-Callovian)
Vaginulina sherborni (Franke)

Direct correlation between the two sections is not feasible as there is not a sufficient number of common species, although *Saccammina* sp. cf. S *S*. *franconica* Ziegler, *Ammodiscus orbis* Lalicker, *A*. sp. cf. *A*. *silicea* (Terquem), *Glomospira pattoni* Tappan, *Trochammina topagorukensis* Tappan, *Verneuilina anglica* Cushman, and *Verneuilinoides* sp. cf. *V*. *georgiae* (Terquem) appear to be restricted to the Oxfordian - Portlandian interval in both sections. The generic composition of the two faunas is, on the whole, quite similar save for the scarcity of calcareous-walled foraminifers in the Linckens Island P-46 well.

Souaya's assemblage differs only in possessing *Ammomarginulina* and *Gaudryina*, which do not occur at Martin Creek. However, many of the genera present only in the finer mesh fractions (#100 and #200) at Martin Creek (i.e. Ammobaculoides, Pseudobolivina, Siphotextularia, Spiroplectammina, Turritellella and Orientalia) are not recorded from Souaya's suite.

The Western Interior of North America

The Jurassic microfaunas of the western interior are among the best studied in North America. Thorough taxonomic and biostratigraphic investigations have been carried out by Brooke and Braun (1972), Lalicker (1950), Loeblich and Tappan (1950a, 1950b) and Wall (1960).

Western interior foraminiferal assemblages are dominated (in the main) by benthonic, calcareous-walled forms belonging predominantly to the nodosariids and polymorphinids. These make up the majority of any given fauna in number of genera and species, but not necessarily in total numbers.

Lalicker (1950) in his investigations of the Ellis Group (Middle to Upper Jurassic) of Montana, obtained a total fauna of thirty-nine species, of which only two were agglutinated and the remainder calcareous. In the type Redwater Shale (Oxfordian) of South Dakota, Loeblich and Tappan (1950a) described fifty-six species of Foraminifera, of which only nine were agglutinated. They noted however, that while the latter constituted only about 15% of the species present, they comprised a fairly large percentage of the total fauna, due to their numerical abundance.

There appears to be a lack of certain genera that are common constituents of Late Jurassic "Boreal" faunas, including: Arenoturrispirillina, "Tolypammina", Recurvoides, and the Eggerella (Eomarssonella)

- *Orientalia* group, *Geinitzinita*, *Pseudolamarckina*, *Ceratocancris* and *Conorboides* sensu stricto. Additionally, there are very few members of the *Haplophragmoides* - *Cribrostomoides* group, which form a dominant element in American Boreal assemblages. Their ?niche seems to be occupied by *Ammodiscus* and/or *Ammobaculites*. The Late Jurassic microfaunas of the western interior appear to have fairly close affinities with coeval northwest European assemblages.

Faunas from the Redwater Shale (Oxfordian) of South Dakota (Loeblich and Tappan, 1950a) and the Middle and Upper Vanguard Formation (late Oxfordian to Kimmeridgian) of southern Saskatchewan (Brooke and Braun, 1972; Wall, 1960) contained the following species which are comparable to those recovered from the Martin Creek section:

Ammodiscus francisi (Wall)
A. orbis Lalicker
A. sp. cf. *A. orbis* Lalicker
A. sp. cf. *A. cheradospirus* Loeblich and Tappan
Bulbobaculites sp. [= *Turritellella* sp. 5-20]
Haplophragmoides tryssa Loeblich and Tappan
Dentalina ejuncida Loeblich and Tappan
Lenticulina audax Loeblich and Tappan
Nodosaria orthostoecha Loeblich and Tappan
N. amphigya Loeblich and Tappan
Saracenaria cypha Loeblich and Tappan
Tristix inornata Loeblich and Tappan
Vaginulinopsis enodis Loeblich and Tappan

When the total faunas of the two areas are compared however, it is apparent that they are quite different, despite the fact that some common elements are present. Perhaps a physical or environmental barrier prevented the two faunas from mixing to any greater extent than is now apparent.

The Grand Banks of Newfoundland

In recent years, the search for hydrocarbons on the eastern seaboard of Canada has brought to light much valuable material on the Jurassic microfaunas of this previously inaccessible region. Gradstein _et_. _al_. (1975) compiled the first comprehensive biostratigraphic zonation of the Jurassic sediments of the Grand Banks area, and Gradstein (1977, 1978), in more detailed studies, synthesized foraminiferal zonation and biogeography.

The foraminiferal assemblages from the Grand Banks demonstrate a markedly "Tethyan" as opposed to a "Boreal" faunal affinity. Gradstein (1977, pp. 562-563) noted that:

> " ... Middle and Upper Jurassic assemblages from Alaska (Tappan, 1955; Bergquist, 1966) and the Western Interior (Loeblich and Tappan, 1950a, 1950b; Wall, 1960; Brooke and Braun, 1972; Gordon, 1970) bear little resemblance to the coeval Grand Banks assemblages ... Nodosariids, many probably different from the Grand Banks ones, and simple arenaceous taxa predominate; epistominiids, '_Globigerina_', and larger foraminifera, often so abundant on the Grand Banks, are missing."

The same remarks can be made when comparing the Grand Banks assemblages with coeval faunas from Siberia (Dain _et_. _al_., 1972), the Canadian Arctic Archipelago (Souaya, 1976; Balkwill _et_. _al_., 1977) and the Martin Creek section. Although Gradstein provides no comprehensive faunal lists, it seems (in the light of the above statements) safe to assume that such characteristic "Boreal" genera as _Arenoturrispiril-_

lina, "Tolypammina", Recurvoides and the Eggerella (Eomarssonella) - Orientalia group are also probably absent from the Grand Banks faunas.

Northwestern Europe

Upper Jurassic foraminiferal faunas from England (Gordon, 1961, 1965; Lloyd, 1959, 1962) and Poland (Bielecka, 1970, 1975; Bielecka and Pożaryski, 1954) bear little resemblance on either the generic or specific levels to their counterparts in the arctic regions (i.e. arctic North America and Siberia) of the northern hemisphere. An indication of this problem was originally noted by Bielecka and Pozaryski (1954, p. 152, English) in trying to correlate the Upper Malm of Poland with the Volga series of Russia. They noticed that while the microfaunas were generally similar, most of the species were different.

The northwest European microfaunas are strongly dominated by calcareous-walled foraminifers, notably nodosariids, polymorphinids and rotaliids. Arenaceous foraminifers are scarce, with the most common genera being: Ammobaculites, Haplophragmoides, and occassionally Textularia (Bielecka, 1975, p. 303). Other, less common genera include: Proteonina, Reophax, Triplasia, Bigenerina, Spiroplectammina, Flabellammina, Nebecularia and Pseudocyclammina. Genera that appear to be characteristic of "Boreal" assemblages are correspondingly absent.

These microfaunas thus appear to be more closely comparable to suites from the western interior of North America than to those found in high arctic regions (see also Wall, 1958, p. 47). In this context, it is interesting to note that Bielecka (1975, p. 304) feels that the Polish Upper Jurassic microfaunas (and perhaps also by analogy the western interior microfaunas) belonged to a "sub-Boreal" faunal province, as the faunal differences between Siberia and Poland are so great.

Western Siberia

The Late Jurassic foraminiferal faunas of western Siberia have been thoroughly documented in recent years by Dain et. al. (1972) and Dain and Kuznetsova (1971). These microfaunas bear the closest resemblance to those encountered at Martin Creek, nothwithstanding the fact that they are geographically much further removed from the latter than is either Alaska or the Sverdrup Basin. This is attributable (in the author's opinion) in large measure to the commendably thorough work of the Soviet investigators, whose studies are much superior to those currently available on arctic North America.

The generic composition of the two faunas is very similar, as shown in Figures 7 and 8. Both suites carry such characteristic Boreal genera as *Arenoturrispirillina*, *Recurvoides*, *Eggerella* (*Eomarssonella*), *Geinitzinita*, *Ceratocancris* and *Pseudolamarckina*. They both appear to lack genera found in the western interior of North America (e.g. *Ammomarginulina* and *Triplasia*) and on the Grand Banks of Newfoundland (epistominids, planktonic calcareous forms). True, at Martin Creek, the suite lacks genera like *Dorothia* and *Miliammina*, while the Siberian faunas lack *Textularia*, *Pseudobolivina* and *Citharina*; but on the whole the similarities greatly outweigh the differences.

Western Siberian species (taken exclusively from Dain *et*. *al*., 1972) that are comparable with those recovered from the Martin Creek section include:

Glomospira pattoni Tappan [= *G*. sp. cf. *G*. *glomerosa* Eicher]

Ammodiscus uglicus Ehremeeva [= *A*. sp. cf. *A*. *orbis* Lalicker]

Reophax adaptatus Dain

Cribrostomoides canui (Cushman)

C. mirandus Dain

Haplophragmoides (?) *canuiformis* Dain [= *Cribrostomoides goodenoughensis* (Chamney)]

Recurvoides gryci (Tappan) [= *R.* sp. *5-4*]

R. disputabilis disputabilis Dain

R. disputabilis plana Dain

R. scherkalyensis Levina

R. sublustris Dain

Trochammina ex. gr. *canningensis*(?) Tappan [= in part, *Ammosphaeroidina* sp. *5-23*]

Ammobaculites multiformis Dain

Haplophragmium pokrovkaensis Kosyreva

Trochammina elevata Kosyreva

T. kosyreva Levina

T. omskensis Kosyreva

T. rostovzevi Levina

Verneuilinoides graciosus Kosyreva

V. postgraciosus Kommisarenko

Eomarssonella paraconica Levina [= *Eggerella* (*Eomarssonella*) *paraconica* Levina]

Astacolus praesibirensis Kosyreva

Geinitzinita praenodulosa Dain

Lenticulina gerkei Dain

Pseudonodosaria brandi (Tappan)

Vaginulinopsis rjavkinoensis Kosyreva [= Marginulinopsis
sp. 6-21)

Eoguttulina ex. gr. inovroclavensis (Bielecka et Pozaryski)

Globulina alexandrae Dain

Guttulina sublimis Dain

Ceratocancris ambitiosus Dain

Pseudolamarckina liapinensis Dain

CHAPTER IV

PALEOECOLOGY

Numerous studies of the ecology of Recent Foraminifera provide the framework on which paleoecological interpretations are normally based. Important syntheses of recent work have been made by Phleger (1960), Murray (1973) and Boltovskoy and Wright (1976). While these workers have provided much detailed information on modern foraminiferal distributions and their (environmental) causes, direct application of these conclusions to older assemblages is severely handicapped by the following factors:

(i) The process of evolution. Workers involved in recent ecological studies (Phleger, 1960; Murray, 1973; Boltovskoy and Wright, 1976) have demonstrated that while the species of a given genus may be diagnostic for certain depth conditions, the genus itself often has a much broader tolerance. For example: Murray (1973, p. 251) reports that two groups of species from the genus _Trochammina_ occupy different habitats. The first is found in hypo- to hypersaline marshes, while the second is characteristic of slope conditions.

When dealing with Late Cretaceous (and older) assemblages, most of the species of a given genus will be different from those in existence today. Thus the applicability of much modern species oriented data is eliminated. In some cases (e.g. _Gravellina_, _Orientalia_) the genus itself has also become extinct, and one is reduced to searching for "best fit" anatomical analogues.

(ii) The emphasis, in modern studies, on either complex agglutinated (i.e. with labyrinthic interiors) or [more normally] calcareous foraminifers. The composition of many recent foraminiferal faunas is rather different than that of certain ancient ones. Calcareous foraminifers (both benthonic and planktonic) dominate modern assemblages and hence are most often used as indicator or marker species. Agglutinated, (and especially "simple" agglutinated) foraminifers almost invariably play a minor rôle in the make up of the assemblages. This circumstance is not always the case in the fossil record. Eicher (1960), Sutherland and Stelck (1972), Stelck (1975), Stelck and Hedinger (1976) and Chamney (1975, 1977) have described faunas of Albian (late Early Cretaceous) age that consist exclusively of simple agglutinated foraminifers. Similar assemblages have been recovered from late Jurassic sediments in arctic North America (Tappan, 1955; Souaya, 1976; present study) although some calcareous elements are present. In these cases, modern studies are of little immediate use, though some gross generalizations can still be made.

(iii) Post-mortem changes in the suites themselves. These factors include transport and mixing of foraminiferal tests (biocoenosis versus thanatocoenosis) and actual alteration of the composition of the test wall by diagenetic processes (i.e. dissolution of calcareous foraminifers by weathering). Boltovskoy and Wright (1976) consider the former factor so important, that in establishing a depth zonation for modern foraminifers, they only rely on the information provided by the living forms or by the biocoenosis. This is clearly impossible when dealing with fossil assemblages.

The problem of removal or loss of calcareous foraminifers by diagenetic means is of equal importance, as it likewise alters the faunal composition of the suites themselves. In the past, outcrop sections have been shown to possess erratic distributions of calcareous foraminifers due to surface leaching. North and Caldwell (1970) have documented this phenomenon in the course of studying the microfauna of the Bearpaw Formation (Upper Cretaceous) in southern Saskatchewan. They noted a great difference in the "kind, quality and quantity" of foraminifers occuring in surface sections as opposed to subsurface sections. On the whole, outcrop sections were either drastically reduced or totally lacking in calcareous foraminifers. Subsurface sections of stratigraphically equivalent sediments were found to carry a rich calcareous assemblage. North and Caldwell (ibid, p. 9) concluded that the calcareous tests had been leached from the former by weathering processes, and therefore restricted their investigations to cored borehole sections.

For the present study, every attempt was made to obtain fresh, unweathered material from the outcrop section although the presence of permafrost within a foot of the surface commonly precluded the digging of deep sample pits. Despite these efforts, calcareous foraminifers in the Lower Member (Husky Formation) show an erratic and somewhat puzzling distribution. In the main, calcareous foraminifers occur sparsely and are fairly to poorly preserved (commonly as steinkerns or pyritic casts) - as might be expected. Two zones however contain rich calcareous faunules. Of these, Zone II (11 meters thick) occurs in an indurated, silty shale; while Zone IV (15 meters thick) occurs in a friable, silty, fine to medium grained quartzose sandstone. Preservation of the calcareous elements in both cases is very good to excellent. Other factors (faunal composition etc.) support the contention that the two faunules probably represent the original arenaceous/calcareous distribution at the time of deposition, and that no subsequent events have appreciably altered the situation.

The actual amount of (post-lithification) leaching of calcareous elements is difficult to assess. Certainly much of the sediment has undergone some weathering, yet two zones, totalling 26 m thickness (about 15% of the section) appear to be only slightly affected. The richest of the two zones (fauna assemblage-zone IV) is located in a friable sandstone, a sediment one would expect to be much more susceptible to groundwater leaching than an indurated shale or mudstone.

In this context it is instructive to examine the gross faunal composition of the Upper Jurassic portion of the Sun-Gulf-Global Linckens Island P-46 well (Souaya, 1976). The samples studied by Souaya were recovered from drill cuttings, so that effects of near-surface leaching are minimal. Despite these favourable circumstances, the fauna recovered consists of 97% arenaceous foraminifers and 3% calcareous foraminifers. This assumes that Souaya correctly identified the Upper Jurassic interval per se as faunas above and below this section (in the P-46 well) contain considerably more calcareous elements. The above evidence seems to indicate that at least some of the barren zones (i.e. barren of calcareous foraminifers) in ancient sediments were controlled more by the then active paleoecological/paleoenvironmental factors than by subsequent destructive processes.

In the light of the above mentioned arguments, the number of studies presenting "convincing" or "reasonable" models for assessing pre-Tertiary foraminiferal paleoecology are rather limited. Sliter and Baker (1972) proposed a well reasoned model for the bathymetric distribution of Cretaceous benthonic foraminifers. The model assumes that because the distribution of Cretaceous benthic ocean-margin foraminifers strongly resembles that of modern day eastern Pacific margin (of southern California) foraminifers, the former must have lived in similar bathymetric conditions. Contrary to many modern foraminiferal studies, which are dependent on species as depth indicators, Sliter and Baker's bathymetric zones are based on generic assemblages. Sliter and Baker (1972, p. 167) define Cretaceous bathymetric assemblages by means of depth restricted genera, overlapping ranges of indicator species, variation in faunal diversity and abundance, and recurrent species associations delineated by numerical analysis. They found these patterns very similar to modern day benthic foraminiferal distributions along the west coast of California. This makes their application to paleoenvironmental studies of other areas much easier. Their model makes the only good "working hypothesis" known to the author at the present time, and is one of the few to clearly outline the ecological niche and significance of agglutinated foraminifers. It is, however, subject to the pitfalls already mentioned.

Chamney (1977) presented a simplified and innovative approach to sorting out paleoenvironments based on what he termed the "morphogroup symbol". He argued that foraminiferal test form and chamber arrangement (regardless of whether the forms were arenaceous or calcareous) indicated the ecological niche the foraminiferal animal was adapting itself to. This hypothesis allows for the quantification of large amounts of data with relative ease. Though intriguing in concept, the data enumerated by Chamney to prove why certain "genomorphs" are characteristic of certain ecological or environmental niches are far from convincing, and lack "hard facts" or proofs from modern studies. Until more data become available to substantiate these assertions, the "morphogroup" approach is treated with caution.

In view of these factors, a detailed paleoecological (and hence paleoenvironmental) interpretation of the foraminiferal fauna of the Lower Member (Husky Formation) is not attempted at the present time. Moreover, since only a single section has been examined, any conclusions drawn from it would be premature, as they would, of necessity, go untested against surrounding material.

The present study limits itself to making observations on the vertical interrelations of four parameters within the Lower Member at Martin Creek, N.W.T. These are: lithology (vertical succession of), foraminiferal number (number of foraminifers recovered per gram of sample used), foraminiferal diversity (both on the generic and specific levels) and the relative changes in the calcareous versus the arenaceous foraminiferal diversity and abundance. A synthesis of these relationships is presented in graphic form in Figure 9, and discussed briefly below.

Foraminiferal Number versus Lithology

Within the Lower Member of the Husky Formation, a strong correlation can be demonstrated to exist between foraminiferal number (herein referred to as F.N.) and lithology. The largest F.N.'s are encountered in slightly to moderately silty shales, while the lowest come from strongly silty shales, siltstones and sandstones. Strongly indurated, pure shales also possess a fairly low F.N. Boltovskoy and Wright (1976, p. 257), in reviewing modern studies on this subject, concluded that although the correlations are not very good, most observations suggest that fine sand mixed with silt or clay contains the richest foraminiferal faunas.

Foraminiferal Number versus Diversity

The relationship of foraminiferal number and diversity is not nearly as straightforward as that of foraminiferal number and lithology. A large F.N. does not necessarily imply a high diversity though this supposition is apparently valid for assemblages found in Subzones Ia and Ic. It is interesting to note that in these faunules the vast majority of foraminifers present are of the simple agglutinated type. A similar observation can be made for the assemblage present in Subzone IIIb.

In contrast to this, the faunules present in Zones II and IV both show high diversity but very low F.N.'s. These assemblages are characterized by relatively large and diverse calcareous populations and rather restricted (though numerically more abundant) arenaceous populations. Therefore, it may be possible to tentatively relate a low F.N. - at least partially - with higher diversity in the calcareous element.

Calcareous Foraminiferal Diversity versus Arenaceous Foraminiferal Diversity

Figure 9 clearly demonstrates the (apparent) relationship between calcareous and arenaceous foraminiferal diversities, irrespective of actual numbers present. An increase in the diversity of the former (both on the genus and species level) is accompanied by a corresponding decrease in the diversity of the latter and the elimination of certain arenaceous genera completely. In the calcareous dominated assemblages (Zones II and IV) common arenaceous genera include: *Saccammina*, *Reophax*, *Cribrostomoides* and *Ammobaculites*. Genera that disappear or whose numbers are greatly diminished include: *Ammodiscus*, "*Tolypammina*", *Textularia*, *Trochammina*, the *Verneuilina* - *Verneuilinoides* group and the *Eggerella* (*Eomarssonella*) - *Orientalia* group.

Arenaceous Foraminiferal Diversity and Lithology

Arenaceous foraminifers appear to be most diverse in the shaly portions of the Lower Member and least diverse in the silty to sandy units. In the latter beds, the forms are usually larger than in the former beds.

Calcareous Foraminiferal Diversity and Lithology

The relationship between calcareous foraminiferal diversity and lithology is ambiguous. The two most diverse faunas - Zones II and IV - occur in two very different lithologies. The former was recovered from indurated, slightly silty shales, while the latter was obtained from friable, interbedded silty shales, siltstones and fine-grained sandstones. Though maintaining some generic elements in common, the overall composition of the two faunules is somewhat different as shown in Table 3. Perhaps with further study, these taxa could serve to indicate slightly differing marine environments.

Genera Restricted to Zone II	Genera Restricted to Zone IV	Genera in Common
Citharina	Marginulinopsis	Dentalina
Marginulina	Planularia	Geinitzinita*
Nodosaria	Astacolus	Lenticulina
	Vaginulinopsis	Pseudonodosaria*
Ceratocancris		Saracenaria
Conorboides	Pseudolamarckina	
		polymorphinids

Asterix (*) species of the "genera in common" are the same. Unless so specified they are different.

Table 3 Generic Composition of Calcareous Faunules from Zones II and IV

Size Fraction Distribution of the Foraminiferal Faunas

In the earliest stages of the present study, it became apparent that arenaceous foraminifers (and to a lesser extent calcareous foraminifers as well) in the Lower Member of the Husky Formation could be divided into two distinct groups on the basis of size fraction distribution of the foraminifers themselves. This discovery would not have been too surprising if the groupings were based on different species of the same genus, as size is considered a valid criterion for the differentiation of species. However, the separation into two distinct groups based, in significant measure, on generic differences is much more difficult to explain. For example, there seems no valid reason why representatives of the genus Spiroplectammina from the Lower Member should be restricted to mesh sizes of #100 or less, when species of the same genus from coeval strata in Siberia reach up to one millimetre in length. Similarly, why should most representatives of the genus Cribrostomoides be limited to mesh sizes of #80 or larger? The observations summarized below support the real possibility that there coexist, within the same suites, assemblages of larger and smaller simple arenaceous foraminifers.

The segregation of the two assemblages (described in detail below) is based on the standard Tyler mesh size of 80 (i.e. 80 lines per inch). The size was chosen because juveniles of "larger" forms rarely occur below the #80 screen and adults of the "smaller" forms rarely occur above it. The "smaller" foraminiferal assemblage is herein termed the "Minus 80 Mesh Fraction", while the "larger" foraminiferal assemblage is termed the "Plus 80 Mesh Fraction". Although many constituents of the minus 80 mesh fraction never occur above the #100 mesh, enough adults of certain genera (particularly *Trochammina* and *Recurvoides*) remain on the #80 screen to make the latter a logical choice for splitting the faunas.

Figures 10 to 13 illustrate graphically the generic distribution of the foraminifers recovered from each of the four standard Tyler screens (Nos. 60, 80, 100 and 200) used in processing the samples. Calcareous forms (where present) are not broken up generically, as over much of the section they occur in such small numbers as to be almost insignificant. Note that the genera present in the #60 and #80 screens are not entirely the same as those present in the #100 and #200 screens. Also of importance is the relative abundance of each genus in a particular mesh fraction within the same sample. For example, the generic composition of a typical assemblage from Suite 75-5-10 (GSC No. 051312), located 13.5 m above the base of the Lower Member is as follows:

60 Mesh Size Fraction:	*Ammodiscus*	3%
	"Tolypammina"	3%
	Reophax	13%
	Cribrostomoides	40%
	Recurvoides	15%
	Ammobaculites	17%
	Trochammina	8%
80 Mesh Size Fraction:	*Saccammina*	2%
	Reophax	1%
	Cribrostomoides	46%
	Recurvoides	15%
	Ammobaculites	5%
	Trochammina	28%

100 Mesh Size Fraction:	Ammodiscus	2%
	Glomospira	1%
	Reophax	1%
	Cribrostomoides	21%
	Recurvoides	27%
	Trochammina	48%
200 Mesh Size Fraction:	Ammodiscus	15%
	Glomospira	19%
	Reophax	2%
	Haplophragmoides	16%
	Recurvoides	10%
	Trochammina	29%
	biserial genera	4%
	triserial genera	2%

The change in faunal composition of the suite is most readily noticeable between the #80 and #100 meshes, though certain of the "larger" foraminifers already are screened out between the #60 and #80 meshes. In this suite the genera Ammodiscus, Reophax, Cribrostomoides, Recurvoides and Trochammina are common to both the +80 mesh and -80 mesh assemblages, though different species are present in each group. The genera "Tolypammina" and Ammobaculites do not appear below the #80 mesh, while Glomospira, Haplophragmoides, biserial genera (undifferentiated) and triserial genera (undifferentiated) do not appear above the #100 screen. Figures 10 to 13 clearly demonstrate that this phenomenon of size distribution - on the generic level - continues undisturbed throughout the section, regardless of the vertical position of the faunas themselves.

Generic Composition of the Assemblages

1. Smaller Foraminifera (Minus 80 Mesh Size Fraction)

Genera restricted to the minus 80 mesh size fraction include: Lituotuba, Turritellella, Glomospira, Haplophragmoides, Spiroplectammina, Textularia, Siphotextularia, Ammosphaeroidina, Verneuilina, Verneuilinoides, and epistominids Ceratocancris, Conorboides and Pseudolamarckina.

Although the genus *Trochammina* is not restricted to this size fraction, it is the most common and the most diverse genus in it. Species of *Ammodiscus*, *Reophax*, *Recurvoides* and *Ammobaculites* are locally important constituents as well.

2. Larger Foraminifera (Plus 80 Mesh Size Fraction)

Genera restricted in occurrence to the plus 80 mesh size fraction are fewer in number than those restricted to the minus 80 mesh size fraction. They include: "*Tolypammina*", *Arenoturrispirillina* and *Cribrostomoides* (included herein are forms listed in the taxonomy as *Evolutinella*). Other genera which are not restricted to this size fraction, but those species contribute measureably to it include: *Saccammina*, *Ammodiscus*, *Reophax*, *Recurvoides*, *Ammobaculites*, *Haplophragmium*, *Eggerella* (*Eomarssonella*) and *Orientalia*.

3. Genera in Common to both Screen Fractions

While it is quite apparent from the above data that some sort of size fraction distribution occurs within the foraminiferal fauna of the Lower Member, it would be misleading to imagine that all genera conveniently fit into either one category or the other. Over 50% of the genera present occur in both assemblages, with different species populating each size fraction. The table below (Table 4) summarizes these variably-sized genera, indicating how many species occur in each size fraction and which are common to both.

TABLE 4 - GENERA COMMON TO BOTH SIZE FRACTIONS

Genus	Species Restricted to +80 Mesh Screen	Species Common to both Meshes	Species Restricted to -80 Mesh Screen
Bathysiphon	1	(1)	0
Saccammina	2	(1)	0
Ammodiscus	5	(1)	2
Reophax	4	(0)	2
Recurvoides	8	(1)	1
Ammobaculites	8	(3)	1
Haplophragmium	3	(1)	0
Trochamminoides	0	(1)	0
Trochammina	5	(2)	8
Ammobaculoides	1	(0)	1
Eggerella (Eomarssonella)	2	(2)	0
Orientalia	2	(2)	0
Citharina	1	(0)	1
Dentalina	4	(1)	2
Geinitzinita	1	(1)	0
Lenticulina	4	(0)	1
Pseudonodosaria	5	(1)	1
Saracenaria	4	(1)	1
Tristix	1	(0)	1
Marginulinulinopsis	1	(1)	0
polymorphinids (undiff.)	2	(2)	0

Even among these variably-sized forms several genera appear to favour one size fraction more than the other. Thus Recurvoides (8 species in the +80 mesh fraction, 1 species in the -80 mesh fraction, 1 species in common) and Ammobaculites (8 species in the +80 mesh fraction, 1 species in the -80 mesh fraction, 3 species in common) seem to favour the +80 mesh size fraction; while the genus Trochammina (5 species in the +80 mesh fraction, 8 species in the -80 mesh fraction, 2 species in common) seems to favour the -80 mesh size fraction.

The causes of this at least partially bimodal generic distribution are not well understood. Post mortem transportation and mixing of two or more foraminiferal faunules is a possible explanation, though one might expect just the opposite effect (i.e. preferential sorting of one size fraction) from current or wave action. Whether it is likely that such thorough mixing would have occurred in every suite collected within the sampled section is another matter. Since the suites are usually composed of both giant (2 to 3 mm) and tiny (0.25 - 0.50 mm) foraminifers of different genera, an uniform ecological or environmental relationship - other than co-existing communities - is difficult to justify.

For example, the small size of certain genera (e.g. Glomospira, Verneuilina or Textularia) could be attributed to dwarfing either due to environmental stress or optimal reproductive conditions (see Boltovskoy and Wright, 1976, pp. 90-93). However, these "dwarf" forms occur side by side with large, robust species of "Tolypammina", Cribrostomoides and Ammobaculites. Why should the former be dwarfed or stunted if the latter are not? Furthermore, why do the same suites lack smaller species of the latter genera?

Since modern foraminiferal faunas are known to contain both "larger" and "smaller" forms, it is not inconceivable that an analogous situation could have existed in the past, with communities of "larger" and "smaller" simple arenaceous foraminifers coexisting in the same general environment. Stelck and Hedinger (1976, and in preparation) noted a similar, partially bimodal generic distribution in a faunule of simple arenaceous foraminifers of latest Albian (Early Cretaceous) age from northeastern British Columbia.

Implications of a Bimodal Generic Distribution

The implications of, at least partially, bimodal generic distribution of foraminifers from the Lower Member of the Husky Formation are threefold:

(1) The distribution, if not artificial (i.e. if not the sole result of post mortem transport and mixing or some byproduct of screen size sorting), could serve to indicate that two - at least partially exclusive - foraminiferal faunules coexisted within the same general environment. The physical or environmental parameters leading to this size differentiation of genera are not understood. The present study is both too general and too specific (only one section was examined) to shed further light on this problem.

(2) The additional fauna supplied by the minus 80 mesh size fraction provides a finer, more sensitive tool for biostratigraphic zonation and paleoenvironmental interpretation. Results of the present study demonstrate that many of the more "prominent" larger forms are long-ranging (i.e. Cribrostomoides canui (Cushman), C. goodenoughensis (Chamney), Ammobaculites alaskensis Tappan) than previously supposed. Of those with a more restricted biostratigraphic range, some occur in rather small numbers (i.e. Ammodiscus sp. cf. silicea Terquem, Trochammina rostovzevi Levina, T. kosyrevae Levina). The fauna of the minus 80 mesh size fraction is not immune to these same shortcomings. Generally speaking, the population of each

successively smaller mesh size fraction recovered from the Lower Member is larger than the previous, with that recovered on the #200 mesh commonly containing a population larger than the three other sieves put together. Thus the numbers of an individual species are somewhat larger and the attendant chances of recovering it that much greater in the finer fractions.

Paleoecological interpretations based solely on the plus 80 mesh fraction would thus give erroneous results. They would indicate a much more restricted environment than was actually the case. A typical Husky plus 80 mesh suite would be dominated by *Cribrostomoides*, *Reophax* and *Ammobaculites*, with minor *Saccammina*, *Ammodiscus*, *Recurvoides* and *Trochammina*. Addition of the #100 mesh fauna would increase the numbers of *Ammodiscus* and *Trochammina* present, while adding *Haplophragmoides*, *Verneuilina*, *Verneuilinoides*, and the *Eggerella* (*Eomarssonella*) - Orientalia group. Such genera as *Glomospira*, *Lituotuba*, *Turritellella*, *Spiroplectammina*, *Textularia*, *Pseudobolivina* and *Siphotextulalaria* would only be encountered if the #200 mesh were examined.

(3) From the practical standpoint of sample preparation, these observations clearly demonstrate the need of using finer sieves to recover all elements of the minus 80 mesh fraction for study. Commercial pickers of microfaunas who are commonly employed by the petroleum industry, should be made aware of the fact that this additional fauna exists and is important to the study being conducted. All too often, the tendency exists to ignore the finer screens as they are more difficult to work with, and the picking process more time consuming.

CHAPTER V - SYSTEMATIC PALEONTOLOGY

Order FORAMINIFERIDA Eichwald, 1830

Suborder TEXTULARIINA Delage and Herouard, 1896

Superfamily AMMODISCACEA Reuss, 1862

Family ASTRORHIZIDAE Brady, 1881

Subfamily RHIZAMMININAE Rhumbler, 1895

Genus Bathysiphon M. Sars, 1872

Bathysiphon sp.

Pl. 3, figs. 1-3

Material: Uncommon, generally well preserved.

Description: Test free, medium-sized, elongate; tubular, open at both ends, flattened, usually represented by only short fragments, test may possess irregular constrictions or swellings throughout the length of the test; wall very finely arenaceous with much siliceous cement, smoothly finished; aperture at open ends of tube.

Dimensions: (in mm)

	Length	Width
Figured specimen A*	0.98+	0.20
Figured specimen B*	1.11+	0.36
specimen C*	0.60+	0.25

* broken specimen

Remarks: Bathysiphon sp. resembles Bathysiphon anomalocoelia Tappan from the Lower Jurassic rocks of northern Alaska, but differs in being slightly smaller and often possessing constrictions and swellings along the length of the test.

Types:[1]

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57083	051415	208.0
Figured specimen B	57084	051379	131.0
specimen C	57085	051409	191.0

Occurrence: Bathysiphon sp. occurs rarely in the upper third of the Lower Member at Martin Creek.

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[1] Specimens selected for "types" are of two basic kinds: those that can be positively assigned to a previously described taxon (hypotypes), and those belonging to a new taxon. In the latter case, those forms which are illustrated in the present study are called "Figured specimens", while those forms which are not illustrated are simply designated "specimens". Each new (unnamed) taxon is usually designated by means of a two number code - i.e. Ammobaculites sp. 7-7. The "GSC Type No." is a code by which the specimen may be located in the Geological Survey of Canada Type Collection. The "GSC Field Loc." is a Geological Survey of Canada code number for the field sample from which the specimen was recovered. The term "H.A.B. (Meters)" refers to the height above the base of the section (in meters) that the particular sample was collected.

Subfamily HIPPOCREPININAE Rhumbler, 1895

Genus Hippocrepina Parker in G.M. Dawson, 1870

Hippocrepina? sp. 7-7

Pl. 3, figs. 4-6

Material: Very rare.

Description: Test free, medium sized, compressed, flask-shaped, consisting of single, undivided chamber which is narrow at base (?proloculus), flaring throughout 75% of test, then tapering upwards towards the aperture; wall very finely arenaceous with much cement, smoothly finished, whitish to gray in appearance; aperture simple, terminal, rounded at the end of a pronounced neck.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.90	0.35	0.23

Remarks: The species has been tentatively placed in the genus Hippocrepina as it does not adequately satisfy the definition of Saccammina. The wall may be at least partially pseudo-chitinous as it is very susceptible to deformation. Badly distorted and ruptured forms currently included in Saccammina sp. cf. S. lathrami Tappan may well actually belong to Hippocrepina? sp. 7-7.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57086	051398	167.0

Occurrence: Hippocrepina sp. 7-7 occurs in a single suite located 167 m above the base of the Lower Member at Martin Creek.

Family SACCAMMINIDAE Brady, 1884

Subfamily SACCAMMININAE Brady, 1884

Genus Saccammina M. Sars in Carpenter, 1869

Pl. 3, figs. 7-11, 14, 15

Saccammina sp. cf. S. lathrami Tappan

?Saccammina lathrami TAPPAN, 1960, p. 289, Pl. 1, figs. 1, 2; p. 289, Pl. 29, figs. 9-12.

Material: Fairly common, generally badly distorted.

Description: Test free, medium-sized, ovate, strongly to moderately compressed; consisting of single, undivided chamber; wall very finely arenaceous with much cement, smoothly finished, whitish-gray in color; test very susceptible to deformation; aperture simple, terminal, commonly obscured due to poor preservation.

Dimensions: (in mm)

	Length	Width	Thickness	Wall D
Figured specimen A*	0.75+	0.58	0.20	0.063
Figured specimen B	0.43	0.38	0.08	-
Figured specimen C	0.63	0.55	0.20	-
Figured specimen D*	?	0.53	0.38	-

*Specimen ruptured

Remarks: The specimens resemble Saccammina lathrami Tappan in most respects, but, due to their poor state of preservation, a direct assignment is not felt warranted at the present time. The way in which many forms are distorted and (commonly) ruptured may imply that the wall was at least in part pseudo-chitinous, and did not have the structural strength of other forms with a wholly agglutinated wall.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57087	051398	167.0
Figured specimen B	57088	051376	110.0
Figured specimen C	57089	"	"
Figured specimen D	57090	"	"

Occurrence: *Saccammina* sp. cf. *S. lathrami* occurs in small numbers rather erratically throughout the upper two-thirds of the Lower Member at Martin Creek.

Saccammina sp. 5-6

Pl. 3, figs. 12, 13

Material: Rare, generally well preserved.

Description: Test free, medium-sized, rounded to slightly ovate; moderately inflated, periphery rounded; consisting of a single, undivided chamber, commonly somewhat laterally compressed, may show a central depression; wall finely arenaceous with much cement, fairly smoothly fininshed; aperture simple, terminal, an elongate slit, occasionally produced on a slight neck.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.79	0.71	0.38
specimen B	0.65	0.48	0.33
Figured specimen C	0.50	0.41	0.16

Remarks: The species differs from *Saccammina* sp. cf. *S. lathrami* Tappan in possessing a more strongly inflated test (despite crushing) than the latter, suggesting perhaps a more agglutinated rather than pseudo-chitinous wall structure. The texture of the wall is also more coarsely arenaceous than that in S. sp. cf. S. lathrami.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57091	051308	7.5
specimen B	57092	051317	21.0
Figured specimen C	57093	"	"

Occurrence: Saccammina sp. 5-6 occurs in rather small numbers throughout the Lower Member.

Saccammina sp. 7-10

Pl. 3, figs. 16, 17

Material: Very rare.

Description: Test free, large, globular, strongly inflated, periphery rounded, consisting of single globular chamber; wall coarsely arenaceous, consisting of unsorted quartz grains set in considerable cement, but not totally covered in latter, roughly finished; aperture obscure.

Dimensions: (in mm)

	Length	Width	Height
Figured specimen A	0.75	0.70	0.60

Remarks: Saccammina sp. 7-10, with its large, globose test is unlike any other species of the genus encountered in the Lower Member. It is also quite distinct from any other species described in the literature.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57094	051401	171.5

Occurrence: *Saccammina* sp. *7-10* occurs in a single suite located 171.5 m above the base of the Lower Member at Martin Creek.

Family AMMODISCIDAE Reuss, 1862

Subfamily AMMODISCINAE Reuss, 1862

Genus *Ammodiscus* Reuss, 1862

Ammodiscus orbis Lalicker

Pl. 5, figs. 11-16

Ammodiscus orbis LALICKER, 1950, p. 11, Pl. 1, fig. 2.

Involutina orbis (Lalicker) TAPPAN, 1955, p. 39, Pl. 8, fig. 14.

Ammodiscus uglicus EHREMEEVA *in* Dain *et. al.*, 1972, p. 34, Pl. II, figs. 1-4.

Ammodiscus uglicus uglicus EHREMEEVA *in* Dain *et. al.*, 1972, p. 35, Pl. V, figs. 6-8, 10, 11.

?*Ammodiscus orbis* Lalicker, SOUAYA, 1976, p. 264, Pl. 7, fig. 3.

Material: Fairly common, generally well preserved.

Description: Test free, medium-sized, discoidal, planispirally coiled, rounded in outline, flattened; consisting of proloculus followed by long, undivided, tubular second chamber, which increases very gradually in diameter with each suceeding volution; about 5 to 7 whorls in adult specimens; sutures distinct, slightly thickened, slightly to non-depressed;

wall finely arenaceous, composed of fairly equant, micro-granular quartz grains with abundant cement, fairly smoothly finished; aperture formed by open end of tube.

Dimensions: (in mm)

	Diameter	Thickness
Hypotype A	0.50	0.075
Hypotype B	0.60	0.075
Hypotype C	0.58	0.100
Hypotype D	0.50	0.063
Hypotype E	0.38	0.075

Remarks: The Husky specimens of Ammodiscus orbis Lalicker are slightly larger than those figured by Lalicker and possess one to one and one half volutions more in the adult forms than do Lalicker's.

The forms belonging to the Ammodiscus uglicus Ehremeeva species group (i.e. A. uglicus, A. uglicus uglicus and A. uglicus ehremeevae) all appear to be nearly or completely conspecific with A. orbis, and, as they also share the same time range (late Middle Jurassic) should probably be considered junior synonyms of the latter.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Hypotype A	57095	051337	51.0
Hypotype B	57096	051342	58.5
Hypotype C	57097	"	"
Hypotype D	57098	"	"
Hypotype E	57099	"	"

Occurrence: Ammodiscus orbis Lalicker occurs in small numbers throughout the lower half of the Lower Member at Martin Creek.

Ammodiscus sp. cf. *A. orbis* Lalicker

Pl. 19, figs. 1-10

?*Ammodiscus orbis* LALICKER 1950, p. 11, Pl. 1, fig. 2.

Involutina sp. cf. *I. orbis* (Lalicker) WALL, 1960, p. 46, Pl. 1, figs. 3-6.

?*Ammodiscus uglicus* EHREMEEVA *in* Dain *et. al*., 1972, p. 34, Pl. II, figs. 1-4, Pl. V, figs. 1-5.

Material: Abundant, several hundred generally well preserved tests available for study;

Description: Test free, small, discoidal, flattened, rounded to slightly ovate in outline; consisting of proloculus (spherical if megalospheric) and long, planispirally coiled, tubular second chamber of 6 to 7 volutions (adult); tube increases very slowly and regularly in diameter throughout growth of test; sutures distinct, spiral, not depressed; wall very finely arenaceous with much cement, smoothly finished; aperture formed by open end of tube.

Dimensions: (in mm)

	Diameter	Thickness
Figured specimen A	0.19	0.039
Figured specimen B	0.23	0.028
Figured specimen C	0.21	0.043
Figured specimen D	0.19	0.032
Figured specimen E	0.19	0.043
specimen F	0.17	0.043
specimen G	0.13	0.028 (juvenile)

Remarks: *Ammodiscus* sp. cf. *A. orbis* Lalicker from the Lower Member of the Husky Formation is identical in size and shape to the species described by Wall (1960) from the Callovian of Saskatchewan. It differs from A. orbis Lalicker in being about one third smaller than the latter.

Ammodiscus uglicus Ehremeeva, from the Callovian of western Siberia is - for all practical purposes - identical to A. orbis Lalicker and probably should be treated as a junior synonym of the latter. Some of the specimens illustrated by Ehremeeva (in Dain et. al. 1972) could be conspecific with A. sp. cf. A. orbis.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57100	051309	7.5
Figured specimen B	57101	"	"
Figured specimen C	57102	"	"
Figured specimen D	57103	"	"
Figured specimen E	57104	"	"
specimen F	57105	051324	33.0
specimen G	57106	"	"

Occurrence: Ammodiscus sp. cf. A. orbis Lalicker occurs throughout the Lower Member at Martin Creek.

Ammodiscus sp. cf. A. cheradospirus Loeblich and Tappan

Pl. 3, figs. 18-21

Ammodiscus cheradospirus LOEBLICH and TAPPAN, 1950b, p. 6, Pl. 1, figs. 1-2b.

Involutina cheradospira (Loeblich and Tappan) TAPPAN, 1955, p. 38, Pl.8, fig. 9.

?Involutina cheradospira (Loeblich and Tappan) WALL, 1960, p. 44, Pl. 2, figs. 1-3.

?Ammodiscus cheradospirus Loeblich and Tappan, BROOKE and BRAUN, 1972, Pl. 8, figs. 4-7.

Ammodiscus cheradospirus Loeblich and Tappan, SOUAYA, 1976, p. 264, Pl. 5, fig. 9, Pl. 6, fig. 19.

Material: About 50 specimens in an adequate state of preservation.

Description: Test free, medium-sized, planispiral, compressed, periphery generally rounded; consisting of proloculus and long, undivided, tubular second chamber which increases in diameter fairly rapidly with each succeeding volution; about 5 to 7 whorls present in adult specimens; suture distinct, very slightly depressed; wall finely arenaceous (with occasional coarser grains) with considerable cement, fairly smoothly finished; aperture at open end of tube.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
specimen A	0.95	0.85	0.13
Figured specimen B	1.05	0.83	0.18
Figured specimen C	1.58	1.10	0.20
specimen D	0.90	0.78	0.13
specimen E	0.65	0.60	0.11

Remarks: Specimens classified as belonging to this species exhibit considerable variation in size, ranging from 0.65 to 1.50 mm in maximum diameter. The form differs from Ammodiscus sp. cf. A. silicea Terquem in possessing a smaller, more compressed, thinner walled test.

Since the original description of Ammodiscus cheradospirus Loeblich and Tappan, two somewhat divergent interpretations of the species have emerged in literature, such that forms of quite different aspect are lumped in the same taxon.

As interpreted by Wall (1960) and Brooke and Braun (1972), A. cheradospirus possesses a rather coarsely agglutinated wall, bound with a small amount of cement, resulting in a decidedly roughened exterior. In addition, the above authors have included specimens to a maximum diameter of 2.0 mm in the species.

Loeblich and Tappan (1950b), Tappan (1955) and Souaya (1976) take a slightly divergent view. As originally defined by the first mentioned of the above, *A. cheradospirus* possesses a rather finely agglutinated wall, with considerable cement. This gives the test a smooth finish.

Within the Lower Member of the Husky Formation, specimens exist that closely approximate both these varieties of *A. cheradospirus*. Until the differences mentioned above are satisfactorily resolved, it is proposed to place forms closely approximating the original definition into the species *A.* sp. cf. *A. cheradospirus* Loeblich and Tappan, and those approximating the Wall - Brooke and Braun definition into the taxon *A.* sp. cf. *A. cheradospirus* var. *A.*

Types:

	GSC Type No.	GSC Field No.	H.A.B. (meters)
specimen A	57107	051317	21.0
Figured specimen B	57108	"	"
Figured specimen C	57109	"	"
specimen D	57110	051318	22.5
specimen E	57111	"	"

Occurrence: *Ammodiscus* sp. cf. *A. cheradospirus* Loeblich and Tappan occurs in small numbers in the basal half of the Lower Member.

Ammodiscus sp. cf. *A. cheradospirus* Loeblich and Tappan var. *A.*

Pl. 5, figs. 7-10

?*Ammodiscus cheradospirus* LOEBLICH and TAPPAN 1950, p. 6, Pl. 1, figs. 1-2b.

Involutina cheradospira(Loeblich and Tappan) WALL, 1960, p. 44, Pl. 2, figs 1-3, *non* TAPPAN, 1955, p. 38, Pl. 8, fig. 9.

Ammodiscus cheradospirus (Loeblich and Tappan) BROOKE and BRAUN, 1972, Pl. 8, figs. 4-7.

?Ammodiscus sp. cf. A. cheradospirus (Loeblich and Tappan) SOUAYA, 1976, p. 264, Pl. 5, fig. 9, Pl. 6, fig. 19.

Material: Very rare.

Description: Test free, large, planispiral, flattened, periphery generally rounded, consisting of proloculus and long undivided, tubular second chamber, which increases in diameter fairly gradually with each volution; about 5 whorls present in the adult form; suture distinct, slightly depressed; wall fairly coarsely arenaceous, composed of medium to fairly coarse quartz silt grains with considerable cement, roughly finished; aperture at open end of tube.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness	Tube Diameter
Figured specimen A	0.78	0.55	0.13	0.050
Figured specimen B	0.55	0.55	0.088	0.063
Figured specimen C	1.38	1.23	0.230	0.063

Remarks: Ammodiscus sp. cf. A. cheradospirus Loeblich and Tappan var. A corresponds roughly to the interpretation of the species used by Hall (1960) and Brooke and Braun (1972). The Husky forms are rather more coarsely agglutinated however, but are too few in number to warrant the establishment of a new specific taxon at the present time.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57112	051409	191.0
Figured specimen B	57113	"	"
Figured specimen C	57114	051410	194.0

Occurrence: *Ammodiscus* sp. cf. *A. cheradospirus* Loeblich and Tappan var. *A.* occurs in small numbers in the upper portion of the Lower Member, above the "Porcupine River Formation" arenites.

Ammodiscus sp. cf. *A. francisi* (Wall)

Pl. 19, figs. 11-17

?*Involutina francisi* WALL, 1960, p. 45, Pl. 1, figs. 1, 2.

?*Ammodiscus francisi* (Wall) BROOKE and BRAUN, 1972, Pl. 8, figs. 8-10.

Material: Common, generally very well preserved.

Description: Test free, small, discoidal, flattened; rounded to slightly ovate in outline, consisting of proloculus [if megalospheric proloculus is ovate in outline, up to 0.05 mm in diameter, and may occupy up to 35% of the test] and long, planispirally wound second chamber of 5 to 6 volutions [microspheric] and 3 to 5 volutions [megalospheric]; tube increases rapidly in diameter, such that in the ultimate volution the tube may be twice as wide as in the first or second volution; test starts out close-coiled, but proceeds to become irregular by the ultimate volution, occasionally even deviating somewhat from the plane of coiling; suture distinct, spiral, slightly depressed; wall very finely arenaceous with much cement, smoothly finished; aperture formed by open end of tube.

Dimensions: (in mm)

	Diameter	Thickness
Figured specimen A	0.22	0.050
Figured specimen B	0.18	0.050
specimen C	0.20	0.028
Figured specimen D	0.20	0.038
specimen E	0.18	0.043
Figured specimen F	0.18	0.038

Remarks: Ammodiscus francisi (Wall) was first described from the Bathonian and Bajocian deposits of southern Saskatchewan. A. sp. cf. A. francisi is of comparable size and general shape to the former but possesses more volutions (5 to 6 versus 4 to 5) and a slightly more irregularly coiled ultimate whorl.

One microspheric and two megalospheric heteromorphs are recognized within the population. The former outnumber both of the latter by approximately 2:1.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57115	051326	36.0
Figured specimen B	57116	051326	36.0
specimen C	57117	"	"
Figured specimen D	57118	"	"
specimen E	57119	"	"
Figured specimen F	57120	"	"

Occurrence: Ammodiscus sp. cf. A. francisi Wall occurs in fair numbers in the basal 50 m of the Lower Member at Martin Creek and only rarely thereafter.

Ammodiscus sp. cf. *A. silicea* Terquem

Pl. 4, figs. 1-5, Pl. 5, figs. 1-6

?*Ammodiscus silicea* TERQUEM, 1862, p. 450, Pl. 6, figs. 11a-b.

?*Involutina silicea* (Terquem) LOEBLICH and TAPPAN, 1954, p. 310, fig. 2.

?*Involutina silicea* (Terquem) TAPPAN, 1955, p. 39, Pl. 9, figs. 1-4.

Ammodiscus sp. cf. *A. siliceus* Terquem, SOUAYA, 1976, p. 264, Pl. 5, fig. 15, *non* Pl. 12, figs. 13.

Material: About 50 specimens in an adequate state of preservation. The tests are fragmentary and negligibly to very strongly deformed.

Description: Test free, rather large, discoidal, planispirally coiled, periphery rounded; test slightly biconcave, consisting of proloculus (commonly obscured) followed by long undivided second chamber, which increases rather rapidly in diameter with each succeeding volution, such that the diameter of the tube in the ultimate whorl may be 3 to 4 times that in the initial whorl; commonly 6 to 7 volutions in the adult test; some specimens are seen to exhibit irregular constrictions at (?random) intervals, but no actual septa were observed; sutures distinct, strongly depressed; wall very finely arenaceous with large amount of cement, very smoothly finished, such that some tests almost appear porcellanous; aperture formed by open end of tube, may appear rounded, semi-circular or slit-like, depending on preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness	TD_1	TD_2	WD
Figured spec. A	3.52	1.78	0.63	-	-	-
Figured spec. B	2.38*	2.18	0.30	0.075	0.313	0.063
spec. C	2.50*	1.75	0.28	0.150	0.350	0.063
Figured spec. D	2.63*	-	0.29	0.063	0.325	0.075
Figured spec. E	1.73	1.15	0.28	-	-	-
Figured spec. F	1.38	0.80	0.33	-	-	-

TD_1 = Tube thickness in earliest whorl present.

TD_2 = Tube thickness in ultimate whorl.

WD = Wallthickness, from ultimate whorl.

* indicates damaged or incomplete individual.

Remarks: The species closely resembles forms assigned to *Ammodiscus silicea* Terquem, but it is about 50% larger than most specimens assigned to the taxon. It differs from *Ammodiscus cheradospirus* Loeblich and Tappan in being much larger, possessing a more rapidly expanding tube, and having a much more finely agglutinated wall. *A. thomsi* Chamney, while being of comparable or even slightly larger dimensions has a more gradually expanding tubular portion, a more flattened profile, and is much thinner. *Ammodiscus veteranus* Kosyreva from the Volgian of western Siberia has a similar overall appearance but is only 1/3 to 1/2 the size.

Many of the tests are deformed to a greater or lesser degree, though this may be attributable solely to large size, the actual wall thickness argues against this. It is thought therefore that the cement used to bind the grains may, at least in part, be pseudochitinous.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57122	051311	12.0
Figured specimen B	57123	"	"
specimen C	57124	"	"
Figured specimen D	57125	051312	13.5
Figured specimen E	57126	029106	0-1.5
Figured specimen F	57127	"	"

Occurrence: *Ammodiscus* sp. cf. *A. silicea* occurs in small numbers throughout the basal 20 meters of the Lower Member at Martin Creek, in beds assigned an early (?) to mid-Oxfordian age.

Genus *Arenoturrispirillina* Tairov

Arenoturrispirillina sp. cf. *A. intermedia* Chamney

Pl. 6, figs. 2-4, 16, 17

?*Arenoturrispirillina intermedia* CHAMNEY 1971, p. 105, Pl. 18A-B, figs. 3-5.

Material: About 15 specimens in a fair to poor state of preservation.

Description: Test free, medium-sized, conical, similar in plan view to *Ammodiscus* but with regular trochospiral coiling, periphery rounded; consisting of proloculus followed by a long, tubular second chamber which increases gradually in diameter with growth; about 5 whorls in adult specimens, initial 3 whorls are sharply conical, last two are much less so; sutures indistinct, slightly depressed; wall very finely arenaceous with considerable cement, smoothly finished and quite translucent; aperture formed by open end of tube.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	1.40	1.075	0.63
Figured specimen B*	1.13	0.89	0.48
Figured specimen C*	1.80	-	1.13
specimen D	0.93	0.63	0.55

* indicates poorly preserved or crushed specimen.

Remarks: *Arenoturrispirillina* [illegible]. cf. *A. intermedia* Chamney is the only representative of *Arenoturrispirillina* sensu stricto found in the Lower Member of the Husky Formation, since the proloculus of the test is not attached to a mobile sand grain. It resembles *A. intermedia* Chamney, but is 50% larger than the specimens illustrated by Chamney.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57128	051336	49.5
Figured specimen B	57129	051337	51.0
Figured specimen C	57130	051338	52.5
specimen D	57131	"	"

Occurrence: *Arenoturrispirillina* sp. cf. *A. intermedia* occurs in small numbers in suites ranging from 48 to 53 m above the base of the Lower Member, from strata of late Oxfordian to Kimmeridgian age.

"*Arenoturrispirillina*" sp. cf. *A. waltoni* Chamney

Pl. 6, fig. 1

?*Arenoturrispirillina waltoni* CHAMNEY, 1971, p. 104, Pl. 17, fig. 7, Pl. 18, fig. 1.

Material: Rare (single specimen).

Description: Test free, large, robust, conical, similar in pattern to *Ammodiscus* but with regular trochospiral coil as in *Ammodiscoides*, periphery rounded; consists of proloculus followed by long tubular second chamber, which increases gradually in diameter with growth; proloculus appears to be attached to a detrital quartz grain; coils slightly overlapping; suture distinct, very slightly depressed; wall composed of microgranular quartz grains with much cement, smoothly finished; aperture at open end of tube.

Dimensions: (in mm)

	Diameter	Height	Tube Thickness Initial*/Final**
Figured specimen A	1.65	0.68	0.088 / 0.150

*initial coil tube thickness
**final coil tube thickness

Remarks: This single specimen differs from *Arenoturrispirillina waltoni* Chamney in several aspects, but due to its large size is tentatively referred to this species. Most importantly, the proloculus is affixed to a mobile quartz grain. This same feature has been noted by Chamney (1971, p. 106) in some specimens of *A. intermedia* Chamney and also occurs in forms assigned to the latter taxon in the section under study. This makes the former's assignment to *Arenoturrispirillina* s.s. questionable (see discussion under description of *A. intermedia*). In addition, the form is not as high spired, the coils are more closely overlapping, and the sutures are less depressed than in *A. waltoni*.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57132	029144	204.3-210.5

Occurrence: The single specimen of "*A.*" sp. cf. *A. waltoni* Chamney comes from the uppermost 15 m of the Lower Member of the Husky Formation on Martin Creek, from strata of Portlandian age.

"*Arenoturrispirillina*" sp. 7-22

Pl. 6, figs. 5, 6, 14, 15

Material: Very rare.

Description: Test free (as a whole) though proloculus attached to a mobile sand (quartz) grain, medium-sized, in shape of a low cone, periphery rounded; consisting of proloculus and long, undivided, tubular second chamber which is arranged in a regular trochospiral coil; about 5 to 6 whorls in adult forms; the whorls do not significantly overlap one another and the tube increases very gradually in size with growth; sutures indistinct, not depressed; wall very finely arenaceous with much cement, smoothly finished; aperture formed by open end of tube.

Dimensions: (in mm)

	Diam max	Diam min	Height	Tube Width*
Figured specimen A	1.05	0.84	0.48	0.100
Figured specimen B**	1.05	-	0.55	0.138
specimen C	0.58	0.45	0.43	0.138
specimen D**	1.00	0.63	0.63	0.112

* Tube width in ultimate whorl

** Damaged or crushed specimen.

Remarks: "*Arenoturrispirillina*" sp. 7-22 differs - on the generic level - from *Arenoturrispirillina* sensu stricto in having the proloculus attached to a mobile sand grain. Chamney (1971) in remarking on certain specimens of *A. intermedia* Chamney noted that many had a "secondary quartz grain" obscuring the proloculus. Yet his illustrations (Chamney, 1971, Pl. 18A-B, fig. 5a-c) indicate that the initial whorls of the tube actually *wrap around* the quartz grain itself, such that it would be impossible for the latter to be a secondary (later) addition. Thus, while these forms may be *Arenoturrispirillina*-like in gross morphology, their initial stages are quite different from those of Arenoturrispirillina. This may warrant the erection of a new generic taxon to handle these specimens.

"Arenoturrispirillina" sp. 7-22 differs from "A." sp. cf. A. waltoni Chamney in being about 25% the size, and possessing a much smaller, more gradually enlargening tube. Both forms however possess a sand grain to which the proloculus is affixed. It differs from A. sp. cf. A. intermedia Chamney in being smaller (50% smaller), having a thinner tube, and lacking the distinct, slightly depressed sutures of the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57133	051413	203.0
Figured specimen B	57134	"	"
specimen C	57135	051411	197.0
specimen D	57136	"	"

Occurrence: "Arenoturrispirillina" sp. 7-22 occurs very rarely in the uppermost 20 m of the Lower Member at Martin Creek, in strata of ?mid to late Portlandian age.

Genus Glomospira Rzehak, 1885

Glomospira sp. cf. G. glomerosa Eicher

Pl. 19, figs. 18-25

?Glomospira glomerosa EICHER, 1960, p. 56, Pl. 3, fig. 6.

Material: Common, over 100 well preserved specimens.

Description: Test free, tiny, equidimensional; consisting of proloculus (never actually observed) followed by irregularly, spirally wound, slowly expanding, tubular second chamber; initial 2 to 3 whorls tightly wound in one plane with remaining coils winding randomly over the entire test; sutures distinct, slightly depressed; wall very finely arenaceous with much cement, smoothly finished; aperture formed by open end of tube.

Dimensions: (in mm)

	Length	Width	Height	Tube Diam
Figured specimen A	0.15	0.13	0.08	0.025
Figured specimen B	0.11	0.11	0.08	0.025
Figured specimen C	0.10	0.10	0.075	0.018
specimen D	0.16	0.15	0.11	0.031
specimen E	0.13	0.10	0.08	0.031
specimen F	0.13	0.13	0.10	0.037
Figured specimen G	0.10	0.10	0.08	0.018

Remarks: Glomospira sp. cf. G. glomerosa Eicher is very similar to G. glomerosa in most respects, differing only in that the tube in the former is not compressed, as is the case in the latter. Eicher first described G. glomerosa Eicher from the Shell Creek Shale (late Albian) of Wyoming. The Husky species is of probable late Oxfordian age, and, to the author's knowledge, no similar forms have been recorded from the intervening period of time (i.e. post-Oxfordian to pre Albian). Taking this fact into consideration, it seems unlikely that these two forms could be conspecific. Rather it is possible that G. sp. cf. G. glomerosa Eicher is an homeomorph of G. glomerosa Eicher.

In addition, it is interesting to note that co-existing in the same suites with G. sp. cf. G. glomerosa Eicher are forms that appear to be homeomorphs of Glomospira tortuosa Eicher. From this close association one could postulate that the Jurassic species might have evolved or developed in an environment similar to their Cretaceous counterparts.

G. sp. cf. glomerosa Eicher closely resembles in its initial stages G. pattoni Tappan, but is much smaller, being 25% to 50% the size of the latter, and possessing a more irregularly coiled later portion. G. perplexa Franke (fide Tappan, 1955) also closely resembles the initial portions of G. sp. cf. G. glomerosa Eicher but is much larger. Some specimens closely resemble juvenile forms of the genus Uzbekistania Sulymanov.

Glomospira sp. cf. G.glomerosa Eicher differs from G. sp. cf. G. tortuosa Eicher in possessing a more regularly coiled initial portion and a more gradually expanding tube.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57137	051307	6.0
Figured specimen B	57138	"	"
Figured specimen C	57139	"	"
specimen D	57140	"	"
specimen E	57141	"	"
specimen F	57142	"	"
Figured specimen G	57143	"	"

Occurrence: Glomospira sp. cf. G. glomerosa Eicher reaches its acme of development in the basal 15 m of the Lower Member and occurs sporadically for another 20 m. Thereafter the genus as a whole disappears from the Lower Member.

Glomospira sp. cf. G. tortuosa Eicher

Pl. 19, figs. 26-33

?Glomospira tortuosa EICHER, 1960, p. 57, Pl. 3, fig. 8.

Material: Common, generally well preserved.

Description: Test free, tiny, "globular" to "ovoid" in outline; periphery rounded; consisting of proloculus and irregularly wound, tubular second chamber, which increases in diameter rather rapidly with growth of test; sutures distinct, moderately depressed; wall very finely arenaceous with much cement, smoothly finished, aperture formed by open end of tube.

Dimensions: (in mm)

	Length	Width	Height	Tube Diam
Figured specimen A	0.16	0.13	0.15	0.063
specimen B	0.18	0.16	0.13	0.043
Figured specimen C	0.15	0.13	0.11	0.050
specimen D	0.13	0.11	0.11	0.050
specimen E	0.11	0.10	0.13	0.038
Figured specimen F	0.15	0.10	0.13	0.038
Figured specimen G	0.15	0.13	0.14	0.043

Remarks: Eicher (1960) first described Glomospira tortuosa from the late Early Cretaceous (late Albian) of the Big Horn Basin of Wyoming. His species is very similar in all aspects (size, tube diameter, coiling mode) to those from the Lower Member of the Husky Formation. It is thus possible that the latter represents a homeomorph of the former, as no similar forms are present in the intervening portion of the stratigraphic column.

G. sp. cf. G. tortuosa Eicher differs from other illustrated species of Glomospira by virtue of its small size and totally irregular mode of coiling.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57144	051307	6.0
specimen B	57145	051307	6.0

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen C	57146	051307	6.0
specimen D	57147	"	"
specimen E	57148	"	"
Figured specimen F	57149	"	"
Figured specimen G	57150	"	"

Occurrence: Glomospira sp. cf. G. tortuosa Eicher occurs within the same suites and has the same vertical distribution as G. sp. cf. G. glomerosa Eicher.

Glomospira(?) sp. 7-22

Pl. 6, figs. 7-12

Material: Very rare.

Description: Test free, small, consisting of spherical proloculus, followed by long, undivided slowly expanding, tubular second chamber; the latter is initially loosely planispirally coiled (3 to 4 volutions) and later tends to wander at random over the face of the test; sutures distinct, fine, strongly depressed (where applicable); wall very finely arenaceous with much cement, smoothly finished; aperture formed by open end of tube.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness	Tube Diam
Figured specimen A	0.28	0.25	0.11	0.075
Figured specimen B	0.23	0.20	0.18	0.075
specimen C	0.25	0.20	0.16	0.050
Figured specimen D	0.38	0.34	0.14	0.075

Remarks: Glomospira(?) sp. 7-22 includes within it a wide scope of morphologic forms from true *Glomospira* to something that could well be classified with *Ammodiscus* (Figured specimen D). All forms are characterized by an instability in coiling design in the final whorls of the test.

G.(?) sp. *7-22* differs from both *G.* sp. cf. *G. glomerosa* Eicher and *G.* sp. cf. *G. tortuosa* Eicher in being twice as large and possessing a more rapidly expanding tube.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57151	051413	203
Figured specimen B	57152	"	"
specimen C	57153	"	"
Figured specimen D	57154	"	"

Occurrence: *Glomospira*(?) sp. *7-22* occurs in small numbers in a single suite located 203 m above the base of the Lower Member.

Genus *Turritellella* Rhumbler, 1904

Turritellella sp. *5-20*

Pl. 19, figs. 42, 43

Bulbobaculites(?) sp. WALL, 1960, p. 56, Pl. 17, fig. 10.

Material: Very rare, 4 specimens in varying states of preservation.

Description: Test free, tiny, elongate, high-spired; consisting of proloculus followed by undivided, close-coiled, tubular second chamber; margins of test slightly lobate; sutures distinct, slightly depressed, running at slight oblique to the horizontal; wall very finely arenaceous with much cement, smoothly finished; aperture at open end of tube, commonly obscured due to preservation.

Dimensions: (in mm)

	Length	Width	Tube Diameter
Figured specimen A	0.29	0.08	0.021-0.029
specimen B	0.24	0.06	-
Figured specimen C	0.20	0.06	-

Remarks: Turritellella sp. 5-20 very closely resembles the form Wall (1960) described as Bulbobaculites(?) sp. from the Upper Member of the Vanguard Formation in Saskatchewan. None of the Husky specimens exhibit the initial, trochospirally coiled, partially noncamerate portion (which makes the form assignable to Bulbobaculites), but this may be missing due to preservation. Wall noted that his form was only tentatively assigned to Bulbobaculites, as some forms "... show no evidence of division into chambers in the earlier portion, which would suggest possible closer affinity to the genus Turritellella Rhumbler." (Wall, 1960, p.57). It is thus highly probable that the two forms are indeed conspecific.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57155	051322	28.5
specimen B	57156	"	"
Figured specimen C	57157	"	"

Occurrence: Turritellella sp. 5-20 occurs in small numbers in a single suite located 28.5 m above the base of the Lower Member.

Turritellella sp. 5-25

Pl. 19, figs. 44-46

Material: Very rare:

Description: Test free, tiny, elongate, high-spired; consisting of proloculus followed by undivided, close-coiled, tubular second chamber, margins of test slightly to moderately lobate; sutures distinct, fine, rather strongly depressed, running at moderate oblique (20° - 30°) to the horizontal; wall very finely arenaceous with much cement, smoothly finished; aperture at open end of tube, commonly obscured or broken off.

Dimensions: (in mm)

	Length	Width	Tube Diam
specimen A	0.28+*	0.08	0.04
Figured specimen B	0.28+*	0.06	0.04
Figured specimen C	0.23+*	0.06	0.04
Figured specimen D	0.18+*	0.05	0.03

* Broken specimen

Remarks: Turritellella sp. 5-25 differs from T. sp. 5-20 in possessing a thicker tube that coils at a much more oblique angle to the horizontal.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
specimen A	57158	051326	36.0
Figured specimen B	57159	051326	36.0
Figured specimen C	57160	"	"
Figured specimen D	57161	"	"

Occurrence: Turritellella sp. 5-25 occurs in small numbers in a single suite located 36 m above the base of the Lower Member at Martin Creek.

Subfamily TOLYPAMMININAE Cushman, 1928

Genus _Tolypammina_ Rhumbler, 1895

"_Tolypammina_" sp. _6-11_

Pl. 7, figs. 1-18

Material: Abundant, generally well preserved.

Description: Test attached to mobile sand grain; medium-sized; consisting of proloculus followed by long, undivided, tubular second chamber; in early whorls tube may wind irregularly over surface of attachment, but quickly assumes a planispiral or nearly planispiral mode of coiling as in _Ammodiscus_; wall very finely arenaceous with considerable cement, fairly smoothly finished; aperture at end of open tube.

Dimensions: (in mm)

	Test Diam	Tube Diam*	Wall Thickness
Figured specimen A	0.57	0.11	-
Figured specimen B	0.66	0.13	-
specimen C	0.91	0.12	-
Figured specimen D	0.51	0.12	0.03
specimen E	0.80	0.12	-
Figured specimen F	0.65	0.12	-
Figured specimen G(j)	0.42	0.08	-
Figured specimen H	0.67	0.18	-
Figured specimen I	0.57	0.13	-

* Tube diameter in the ultimate whorl
(j) = juvenile specimen

Remarks: The surface of attachment is almost invariably a quartz grain in the medium sand range (average diameter from 125 measured specimens is 0.25 mm). The grains themselves range in shape from subangular to well rounded. The form differs from the genus _Tolypammina_ Rhumbler _sensu stricto_ in being attached to a mobile sand grain rather than a stable surface and therefore being in essence "free" rather than attached. The genus can be most closely compared with _Tolypammina_ sensu

Kosyreva (in Dain *et*. *al*., 1972). However, in Kosyreva's form, the tube wanders over the face of the sand grain and never assumes the planispiral mode of coiling.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57162	051337	125.0
Figured specimen B	57163	051337	125.0
specimen C	57164	"	"
Figured specimen D	57165	"	"
specimen E	57166	"	"
Figured specimen F	57167	"	"
Figured specimen G	57168	"	"
Figured specimen H	58504	051311	12.0
Figured specimen I	58505	051311	12.0

Occurrence: "*Tolypammina*" sp. *6-11* occurs in large numbers in suites located 125 to 143 m above the base of the Lower Member.

"*Tolypammina*" sp. *7-18*

Pl. 7, figs. 19-23, 27, 28

Material: Somewhat rare, about 20 specimens in an adequate state of preservation.

Description: Test (as a whole) free, medium-sized, initial portion is streptospirally coiled, becoming planispiral in later portion, periphery rounded to somewhat ovate; consisting of proloculus - which is attached to a mobile sand grain - and long, undivided, tubular second chamber, which enlarges in diameter fairly rapidly with growth; about 3 to 4 volutions present in adult specimens; initial whorl slightly streptospirally coiled as it winds over the surface of the sand grain, later whorls planispirally coiled; sutures distinct, moderately depressed; wall very finely arenaceous with much cement, smoothly finished; aperture formed by open end of tube.

Dimensions: (in mm)

	Max Diam	Min Diam	Tube Width (Max)
Figured specimen A	1.05	0.68	0.138-0.150
specimen B	0.70	0.60	0.125
specimen C	0.80	0.73	0.100-0.112
Figured specimen D	0.70	0.58	0.100
Figured specimen E (j)	0.43	0.43	0.075-0.088

(j) Juvenile specimen

Remarks: "Tolypammina"sp. 7-18 differs from "T." sp. 6-11 in having a much thicker tube (for a comparable test diameter) than the latter, having fewer volutions in the adult form, and possessing finer, more strongly impressed sutures.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57169	051409	191.0
specimen B	57170	051409	191.0
specimen C	57171	"	"
Figured specimen D	57172	"	"
Figured specimen E	57173	"	"

Occurrence: "Tolypammina" sp. 7-18 occurs in small numbers from 190 to 193 m above the base of the Lower Member, in beds of ?mid to late Portlandian age.

Genus Lituotuba Rhumbler, 1895

Lituotuba sp. 5-5

Pl. 19, figs. 34-41

Lituotuba irregularis TAPPAN, 1955, p. 41, Pl. 9, fig. 8, non figs. 5-7, 9.

Material: Rare.

Description: Test free, tiny, consisting of proloculus and long, undivided, tubular second chamber, which coils in an irregular (?random) fashion around the test; very rarely in the latter portion of the test the tube detaches from the test proper and attempts to become rectilinear; sutures distinct, depressed; wall very finely arenaceous with much cement, smoothly finished; aperture presumed to be at open end of tube, not actually observed.

Dimensions: (in mm)

	Length	Width	Thickness	Diam Tube
Figured specimen A	0.18	0.15	0.09	0.05
specimen B	0.18	0.14	0.11	0.04
Figured specimen C	0.15	0.11	0.09	0.03
specimen D	0.18	0.13	0.09	0.05
Figured specimen E	0.13	0.13	0.10	0.04
Figured specimen F	0.18	0.14	0.08	0.03

Remarks: This form cannot be assigned with certainty to the genus Lituotuba, as it lacks the well developed rectlinear portion that is characteristic of the latter. The species does, however closely resemble certain forms that were included by Tappan in Lituotuba irregularis Tappan, and therefore is tentatively placed within this genus.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57174	051307	6.0
specimen B	57175	"	"
Figured specimen C	57176	"	"

specimen D	57177	051306	4.5
Figured specimen E	57178	"	"
Figured specimen F	57179	"	"

Occurence: *Lituotuba* sp. *5-5* occurs in small numbers in suites located 4.5 to 6.0 m above the base of the Lower Member at Martin Creek.

Superfamily LITUOLACEA de Blainville, 1825

Family HORMOSINIDAE Haeckel, 1894

Subfamily HORMOSININAE Haeckel, 1894

Genus *Reophax* Montfort, 1808

Reophax minuta Tappan

Pl. 19, figs. 47-50

Reophax minuta TAPPAN, 1940, p. 94, Pl. 14, figs. 4a-b; TAPPAN, 1943, p. 480, Pl. 77, figs. 4a-b; FRIZZELL, 1954, p. 57, Pl. 1, figs. 11a-b; TAPPAN, 1962, p. 132, Pl. 30, fig. 10.

?*Reophax pepperensis* Loeblich, TAPPAN, 1962, p. 133, Pl. 30, fig. 14.

Reophax sp. *B*. SOUAYA, 1976, Pl. 10, fig. 9, Pl. 12, fig. 3.

Material: Common, generally well preserved.

Description: Test free, tiny, elongate, parallel-sided; periphery rounded; chambers numerous (up to 8 observed), uniserially arranged; chambers equant to slightly elongate, increasing gradually in size as added, slightly inflated, rounded in section; sutures distinct, straight, slightly depressed; wall finely to very finely arenaceous with considerable cement, fairly smoothly finished; aperture simple, terminal, rounded, occasionally slightly projected on a short neck.

Dimensions: (in mm)

	Height	Width
Hypotype A	0.40+	0.088
Hypotype B	0.33+	0.088
Hypotype C	0.30	0.050
Hypotype D	0.30	0.075

Remarks: Reophax minuta Tappan was originally described from the Upper Albian (latest Lower Cretaceous) Grayson Formation of northern Texas. It has subsequently been described from deposits of Albian age in Oklahoma (Frizzell, 1954) and Alaska (Tappan, 1962). The forms present in the Lower Member of the Husky Formation are indistinguishable from those figured by Tappan (op. cit.) from the Albian of Alaska. Souaya (1976) has described forms identical to the present specimens from the Rhaetic (Upper Triassic) of Linckens Island, Canadian Arctic Archipelago. From the above evidence, it is evident that the basic "Reophax minuta form" is very long-ranging indeed, and probably of little biostratigraphic value.

Reophax pepperensis Loeblich was originally distinguished from R. minuta Tappan by it's smaller size (0.25 mm for the former versus 0.50 mm for the latter) and slightly tapering test. It is not at all clear therefore how Tappan (1962) can distinguish the two species, as her R. pepperensis specimens range up to 0.50 mm in size and appear to be parallel-sided rather than tapering. Therefore, Tappan's Alaskan forms (which she designated as R. pepperensis Loeblich) have been tentatively placed in synonomy with R. minuta Tappan.

In many of the specimens recovered from the Lower Member, the initial portions of the test have been broken off, such that several chambers are missing. Chamber dimensions appear to be quite variable, ranging from broader than high to equant. The ultimate chamber sometimes tapers, and may be quite pyriform in shape. It is therefore possible that more than one species may be present here, but until better material is obtained, all forms are placed within the same specific taxon.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	57180	051324	33.0
Hypotype B	57181	051324	33.0
Hypotype C	57182	051326	36.0
Hypotype D	57183	051326	36.0

Occurrence: Reophax minuta Tappan occurs in small to abundant numbers (5 to greater than 50 specimens per suite) throughout the Lower Member at Martin Creek; though occurrences are sporadic and do not seem to follow any pattern.

Reophax metensis Franke

Pl. 7, figs. 24-26, 29-31

Reophax metensis FRANKE, 1936, p. 19, Pl. 1, figs. 17a-b; BARTENSTEIN and BRAND, 1937, p. 133, Pl. 10, fig. 8, Pl. 13, figs. 1a-b, 4; TAPPAN, 1955, p. 36, Pl. 7, figs. 11-14; non SOUAYA, 1976, p. 266, Pl. 5, fig. 4.

Material: Abundant, very well to indifferently preserved.

Description: Test free, large, elongate, consisting of 2 to 3 large, rounded chambers in a straight or slightly curved, uniserial arrangement; chambers rounded, strongly inflated, increasing rapidly in size as added, ultimate chamber globular to pyriform in shape, wider at base than at top, occupies 50% to 65% of entire test; sutures distinct, strongly constricted; wall composed of coarse quartz grains set within, and surrounded by, finer matrix and siliceous cement, with occasional grains sticking out of the matrix; aperture terminal to slightly off centre, rounded, commonly produced on rather elongate neck.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Hypotype A	0.65	0.33	1.05
Hypotype B	0.53	0.28	0.88
Hypotype C	0.43	0.23	0.85
Hypotype D	0.40	0.25	0.68
Hypotype E	0.30	0.20	0.63
Hypotype F	0.63	0.38	1.00

Remarks: Reophax metensis Franke from the Lower Member of the Husky Formation at Martin Creek closely resembles forms assigned to the same taxon by Tappan (1955) from the Lower Jurassic of the north slope of Alaska. It is also possible that the forms assigned by Tappan (op. cit.) to Reophax liassica Franke may in fact be microspheric heteromorphs of R. metensis Franke.

R. metensis Franke differs from R. sp. 5-10 in having a wall composed of approximately equant grains of quartz set within the cement matrix, whereas the latter has a wall composed of medium to very coarse grains lightly imbedded in cement, and giving the overall impression of studding grains. The ultimate chamber of R. metensis is also much more inflated, and the neck is more elongate.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	57184	051326	36.0
Hypotype B	57185	051326	36.0
Hypotype C	57186	051325	34.5
Hypotype D	57187	051325	34.5
Hypotype E	57188	"	"
Hypotype F	57189	051309	9.0

Occurrence: Reophax metensis Franke occurs erratically throughout the Lower Member at Martin Creek. This sporadic distribution may be related to environmental restrictions imposed on the form.

Reophax sp. cf. *R. adaptatus* Dain

Pl. 7, figs. 32, 33; Pl. 8, figs. 10-12

?*Reophax adaptatus* DAIN, 1972, p. 43, Pl. VI, figs. 3-5, *non* figs. 6, 7.

Reophax sp. cf. *R. metensis* Franke, SOUAYA, 1976, p. 266, Pl. 5, fig. 4.

Material: Common.

Description: Test free, large, elongate; consisting of two (most commonly) or three robust chambers in a straight or very slightly curved uniserial arrangement; chambers robust, rounded, strongly inflated (commonly crushed in preservation), increasing rapidly in size as added; ultimate chamber commonly pyriform, much wider at base than at top, occupies about 50% to 75% of test; wall composed of subangular to subrounded grains of quartz (mainly in the fine sand size range) apparently rather shallowly set in matrix (cement) giving a very rough and uneven surface finish; sutures indistinct, depressed, straight; aperture simple, terminal, may be produced on slight neck.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	1.28	0.75	1.78
Figured specimen B	0.78	0.45	1.38
specimen C	0.70	0.43	1.35
specimen D	0.68	0.30	1.13
specimen E	0.48	0.30	0.83
specimen F	1.20	0.53	1.58
Figured specimen G	0.68	0.33	1.03

Remarks: *Reophax* sp.cf. *R. adaptatus* Dain is similar in all respects to *R. adaptatus* Dain, except that the Husky forms are somewhat larger. It is similar in overall appearance and size to *R. metensis* Franke, but differs in the construction of the wall, which is more coarsely arenaceous and held together with much less cement. The aperture is also produced on a much shorter (relatively) neck than on R. metensis.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57190	051412	200.0
Figured specimen B	57191	051412	200.0
specimen C	57192	"	"
specimen D	57193	"	"
specimen E	57194	"	"
specimen F	57195	051413	203.0
Figured specimen G	57196	051413	203.0

Occurrence: Reophax sp. cf. R. adaptatus Dain occurs sporadically throughout the Lower Member at Martin Creek. It is only rarely found together with R. metensis Franke, and it is possible that the two species are mutually exclusive.

Reophax sp. 5-10

Pl. 8, figs. 6-9

?Reophax suevicus Franke, SOUAYA, 1976, p. 267, Pl. 5, fig. 2.

Material: Fairly common.

Description: Test free, large, elongate; consisting of 3 to 4 chambers in a straight, uniserial arrangement; chambers robust, slightly inflated, increasing fairly rapidly in size as added; ultimate chamber slightly pyriform in shape, taller than broad, tapering, occupies 33% to 50% of test; wall coarsely agglutinated, composed of subrounded quartz grains set in small amount of siliceous cement, very roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.83	0.63	1.75
Figured specimen B	0.85	0.53	1.88
specimen C	0.78	0.58	1.63
Figured specimen D	0.83	0.60	1.60
specimen E	0.78	0.65	1.75
specimen F	0.65	0.48	1.15

Remarks: Reophax sp. 5-10 bears close resemblance to R. suevicus Franke as figured by Souaya (1976), though it is impossible to determine how many chambers are actually present in Souaya's form. It differs from R. metensis Franke in lacking the strongly inflated, pyriform ultimate chamber of the latter, and in possesing a much more coarsely agglutinated wall with perceptibly less cement. It is quite similar to R. adaptatus Dain (and other closely allied forms from the Lower Member of the Husky Formation), but differs in possessing a less acutely tapered test and lacking the large, pyriform ultimate chamber.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57197	051312	13.5
Figured specimen B	57198	051312	13.5
specimen C	57199	"	"
Figured specimen D	57200	051309	9.0
specimen E	57201	051309	9.0
specimen F	57202	"	"

Occurrence: Reophax sp. 5-10 occurs in large numbers in the basal 15 m of the Lower Member at Martin Creek.

Reophax sp. 5-25

Pl. 20, figs. 1-5

Material: Common, generally well preserved.

Description: Test free, small, stubby, uniserial; consisting of two to three chambers which increase in size rapidly as added; chambers inflated, rounded in section; ultimate chamber pyriform, widest at base and tapering to a distinct neck, commonly occupies 50% to 75% of entire test; sutures distinct, straight, horizontal, slightly constricted; wall finely arenaceous with much cement, rather roughly finished; aperture simple, terminal, rounded, at the end of a pronounced neck.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.45	0.21
Figured specimen B	0.43	0.20
specimen C	0.31	0.20
Figured specimen D	0.48	0.20
Figured specimen E	0.38	0.21
specimen F	0.50	0.28
Figured specimen G	0.44	0.18

Remarks: Reophax sp. 5-25 closely resembles R. liassica Franke as figured by Tappan (1955) from the Lower Jurassic of the north slope of Alaska. The Husky form is however about 50% to 66% smaller and possesses fewer chambers. It is much smaller than either R. metensis Franke (from which it also differs in having less inflated, more elongate chambers) or R. sp. cf. R. adaptatus Dain. Additionally, R. sp. 5-25 is much more finely arenaceous than the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57203	051326	36.0
Figured specimen B	57204	051326	36.0
specimen C	57205	"	"
Figured specimen D	57206	"	"
Figured specimen E	57207	"	"
specimen F	57208	051329	39.0
Figured specimen G	57209	051329	39.0

Occurrence: *Reophax* sp. 5-25 occurs in small numbers throughout the Lower Member at Martin Creek.

Reophax(?) sp. cf. *R. densa* Tappan

Pl. 8, figs. 1-5

?*Reophax densa* TAPPAN, 1955, p. 36, Pl. 8, figs. 1-6.

Material: Fairly common.

Description: Test free, large, elongate; very gently tapering to nearly parallel-sided; consisting of 5 to 6 chambers in straight, uniserial arrangement; proloculus commonly broken off; chambers initially broader than tall, later equant, moderately inflated; sutures distinct, fine, horizontal, strongly constricted; wall coarsely arenaceous, consisting of subrounded quartz grains set in considerable siliceous cement, somewhat roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	D^1	D^2	D^3	Height
Figured specimen A*	0.59	0.68	0.65	1.95+
Figured specimen B*	0.65	0.60	0.60	1.89+
specimen C*	0.71	0.65	0.70	1.80+
specimen D*	0.58	0.63	0.55	1.95+

* Initial portion broken off.

D^1 Diameter of initial chamber.

D^2 Diameter largest chamber in uniserial portion save ultimate.

D^3 Diameter ultimate chamber.

Remarks: Reophax(?) sp. cf. R. densa Tappan closely resembles megalospheric heteromorphs of R. densa Tappan from the Lower Jurassic of Alaska's north slope. It differs from R. suevicus Franke in possessing more closely appressed, equant chambers and a straight rather than curved test. Because the initial portion of the test is almost invariably missing due to poor preservation, the form is tenatively placed in the genus Reophax, though it could equally well belong with Ammobaculites.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57210	051312	13.5
Figured specimen B	57211	051312	13.5
specimen C	57212	"	"
specimen D	57213	"	"

Occurrence: Reophax(?) sp. cf. R. densa Tappan is restricted in occurrence to the basal 25 m of the Lower Member at Martin Creek.

Family LITUOLIDAE de Blainville, 1825

Subfamily HAPLOPHRAGMOIDINAE Maync, 1952

Remarks: Loeblich and Tappan (1964) included within the definition of the Haplophragmoidinae all forms with a test that was "free, coiled, interior simple, not labyrinthic, no alveolar hypodermis". Alekseitchuk-Mitskevitch (1973) in working on a revision of Russian taxonomic nomenclature of the Family Haplophragmiidae [= Lituolidae] proposed a refinement of the Haplophragmoidinae which would separate streptospirally coiled forms from planispirally coiled varieties. Alekseitchuk thus split the Haplophragmoidinae into two new subfamilies: the Recurvoidinae with a streptospiral coiling arrangement, and the Haplophragmoidinae, with a planispiral coiling arrangement.

The new subfamily Recurvoidinae includes the following genera: Recurvoides Earland, 1934, Thalmannammina, Pokorny, 1951 and Trochamminita, Cushman et Bronniman, 1948. If one is to be consistent with the definition of the subfamily, then the genus Budashevella Loeblich and Tappan, 1964, should also be added to the list.

The subfamily Haplophragmoidinae (restricted) includes those forms remaining after the exclusion of the Recurvoidinae (i.e. those forms with a planispiral or nearly planispiral mode of coiling). The genera included at present are: Haplophragmoides Cushman, 1910; Adercotrema Loeblich and Tappan, 1952; Cribrostomoides Cushman, 1910; Daxia Covillier et Szakall, 1949; Discammina Lacroix, 1932; Evolutinella Myatliuk, 1971; and Trochamminoides Cushman, 1910.

The splitting of the Haplophragmoidinae on the above criteria is thought to be an useful innovation, and the classification outlined above is used throughout the text.

Genus *Haplophragmoides* Cushman, 1910

Remarks: All North American literature on boreal Jurassic - Cretaceous microfaunas has tended to classify any planispirally coiled, involute to moderately evolute foraminifers as belonging to the genus *Haplophragmoides* Cushman (i.e. Tappan, 1955, 1962; Chamney, 1969). The Russians, in working with their boreal faunas were among the first to point out (i.e. Dain *et*. *al*., 1972) that many of these forms had, in fact, areal rather than basal apertures; and that, furthermore, the apertures quite commonly carried a bordering lip. This necessitated their generic reassignment to *Cribrostomoides* Cushman, 1910.

Thin section studies of excellently preserved material from the Lower Member of the Husky Formation have proven the Russian workers to be, in large measure, correct. Indeed, *all* forms recovered from the plus 80 mesh fraction were found to possess raised, lipped apertures, thus rendering them assignable to either *Cribrostomoides* or *Evolutinella* rather than *Haplophragmoides*. Species previously assigned to *Haplophragmoides* and herein assigned to either of the former genera include: *Cribrostomoides goodenoughensis* (Chamney), *Cribrostomoides canui* (Cushman) and *Evolutinella* sp. *6-25*. The only true *Haplophragmoides* s.s. Found to date in the Lower Member are those belonging to the *Haplophragmoides* sp. cf. *H*. *tryssa* Loeblich and Tappan species group, which occurs mainly in the minus 80 mesh fraction.

Haplophragmoides sp. cf. H. tryssa Loeblich and Tappan

Pl. 20, figs. 6-13

?Haplophragmoides tryssa LOEBLICH and TAPPAN, 1950a, p. 41, Pl. 11, figs. 2a-b; BROOKE and BRAUN, 1972, Pl. 8, figs. 37-39; non WALL, 1960, p. 50, Pl. 14, figs. 18, 19.

non Haplophragmoides sp. cf. H. tryssa Loeblich and Tappan, SOUAYA, 1976, p. 267, Pl. 6, fig. 14.

Material: Abundant, over 200 tests in excellent state of preservation.

Description: Test free, small, planispirally coiled, completely involute; rounded quadrangular in outline, slightly compressed, periphery rounded; consisting of 4 to 5 chambers; chambers slightly inflated, increasing very gradually in size as added; sutures distinct, fine, very slightly depressed, straight; wall very finely arenaceous with much cement, smoothly finished; aperture an elongate slit at the base of the terminal chamber.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.23	0.20	0.13
specimen B	0.21	0.23	0.10
Figured specimen C	0.18	0.19	0.10
specimen D	0.23	0.23	0.10
Figured specimen E	0.18	0.20	0.10
specimen F	0.21	0.21	0.10

Remarks: Haplophragmoides tryssa Loeblich and Tappan was originally described from the type Redwater Shale (Oxfordian) of South Dakota. Subsequent workers (Wall, 1960; Brooke and Braun, 1972) have extended it's range to southern and central Saskatchewan.

Haplophragmoides sp. cf. H. tryssa Loeblich and Tappan differs very little from H. tryssa sensu stricto. It possesses somewhat more "regularly" (?rigidly) formed chambers that maintain a near constant size from first to last, with the sutures meeting the umbilicus at an angle of between 80° and 100°. Specimens that attempt to increase the number of chambers in the ultimate whorl from the normal 4 to 4.5 to 5 or 6 cause distortion of the planispiral coiling such that while one side remains involute, the other becomes evolute. These distortions of the test allow for the recognition of two additional varieties.

Loeblich and Tappan (1950a) noted the close relationship of _H. tryssa_ with _H. kirki_ Wickenden, from the Upper Cretaceous (Campanian to Maastrichtian) of Alberta and Saskatchewan. While admitting that the two species were alike in size and chamber arrangement, they stated that the chambers of the former were less inflated. A study of the literature on each form generally seems to uphold their decision. It should be pointed out however, that the two species are, in all probability, homeomorphs of each other; and that crushed specimens of _H. kirki_ would be difficult to distinguish from _H. tryssa_.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57214	051312	13.5
specimen B	57215	051312	13.5
Figured specimen C	57216	"	"
specimen D	57217	"	"
Figured specimen E	57218	051311	12.0
specimen F	57219	051311	12.0

Occurrence: _Haplophragmoides_ sp. cf. _H. tryssa_ Loeblich and Tappan occurs commonly throughout the basal 35 m of the Lower Member at Martin Creek. Its disappearence coincides closely with the disappearence of _Glomospira_ sp. cf. _G. glomerosa_ Eicher and _G._ sp. cf. _G. tortuosa_ Eicher.

Haplophragmoides sp. cf. H. tryssa Loeblich and Tappan var. 1

Pl. 20, figs. 14-21

?Haplophragmoides tryssa LOEBLICH and TAPPAN, 1950a, p. 41, Pl. 11, figs. 2a-b; BROOKE and BRAUN, 1972, Pl. 8, figs. 37-39; non WALL, 1960, p. 50, Pl. 14, figs. 18, 19.

non Haplophragmoides sp. cf. H. tryssa Loeblich and Tappan, SOUAYA, 1976, p. 267, Pl. 6, fig 14.

Material: Quite common, about 100 well preserved specimens available.

Description: Test free, small, slightly compressed, planispirally coiled; involute to semi-evolute, rounded in outline, periphery slightly lobate; chambers slightly inflated, quadrangular, expanding very gradually as added; about 5 to 6.5 chambers in the ultimate whorl; sutures distinct, straight, very slightly depressed; wall very finely arenaceous with much cement, smoothly finished; aperture an elongate slit at the base of the terminal chamber.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.29	0.26	0.13
Figured specimen B	0.28	0.26	0.11
specimen C	0.25	0.19	0.10
specimen D	0.25	0.19	0.10
Figured specimen E	0.24	0.20	0.08
specimen F	0.24	0.19	0.10

Remarks: Haplophragmoides sp. cf. H. tryssa Loeblich and Tappan var. 1 differs from H. sp. cf. H. tryssa senso stricto in having more rounded, somewhat more compressed chambers, and in possessing 5 to 6.5 chambers in the ultimate whorl. The chambers are still added in the same mode as in H. sp. cf. H. tryssa senso stricto, such that there is little or no apparent increase in chamber size from the first visible [in the last whorl] to the ultimate. In order to accommodate these extra chambers the species is forced to change from totally involute to partially evolute.

While still coming from the same parent stock, *H.* sp. cf. *H. tryssa* var. 1 is itself a transitional variant to *H.* sp. cf. *H. tryssa* var. 2, in which the whorl actually assumes a pseudo-trochospiral coiling arrangement.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57220	051312	13.5
Figured specimen B	57221	"	"
specimen C	57222	051313	15.0
specimen D	57223	"	"
Figured specimen E	57224	"	"
specimen F	57225	"	"

Occurrence: *Haplophragmoides* sp. cf. *H. tryssa* Loeblich and Tappan var. 1 occurs in small numbers in the basal 40 m of the Lower Member at Martin Creek.

Haplophragmoides sp. cf. *H. tryssa* Loeblich and Tappan var. 2

Pl. 20, figs. 22-28

?*Haplophragmoides tryssa* LOEBLICH and TAPPAN, 1950a, p. 41, Pl. 11, figs. 2a-b; BROOKE and BRAUN, 1972, Pl. 8, figs. 37-39; non WALL, 1960 p. 50, Pl. 14, figs. 18, 19.

non *Haplophragmoides* sp. cf. *H. tryssa* Loeblich and Tappan, SOUAYA, 1976, p. 267, Pl. 6, fig. 14.

Material: Fairly common.

Description: Test free, small, slightly compressed; coiling complex "pseudo-trochospiral" in nature, i.e. one side appears involute, while obverse side appears to be totally evolute; periphery slightly lobulate; chambers rounded, slightly inflated, increasing very gradually in size as added; sutures distinct, straight, very slightly depressed; wall very finely arenaceous with much cement, smoothly finished; aperture an elongate slit at the base of the ultimate chamber, commonly obscured due to preservation.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.23	0.21	0.11
Figured specimen B	0.23	0.25	0.13
specimen C	0.26	0.24	0.13
specimen D	0.28	0.25	0.13
Figured specimen E	0.28	0.25	0.13

Remarks: *Haplophragmoides* sp. cf. *H. tryssa* var. *2* differs from *H.* sp. cf. *H. tryssa* var. *1* in having a "pseudo-trochospiral" coil - i.e. a complex coiling pattern that is no longer truly planispiral. In this arrangement it is evident that the proloculus has shifted to one side of the coil and actually become exposed on that side of the test. This causes one side of the test to appear evolute while the other remains involute, thus generating a pseudo-trochospiral effect. Specimens which are extremely distorted in this fashion resemble juvenile *Recurvoides*.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57226	051326	36.0
Figured specimen B	57227	"	"
specimen C	57228	"	"
specimen D	57229	"	"
Figured specimen E	57230	051315	18.0

Occurrence: Haplophragmoides sp. cf. H. tryssa Loeblich and Tappan var. 2 occurs in the basal 60 m of the Lower Member at Martin Creek.

Haplophragmoides sp. 5-61

Pl. 21, figs. 1-8

Material: Rare, about 10 specimens in excellent state of preservation.

Description: Test free, small, planispirally coiled, totally evolute, laterally compressed; umbilical areas slightly depressed, chambers few, slightly inflated, increasing gradually in size as added, about 6 in ultimate whorl; sutures distinct, fine straight, slightly depressed; wall agglutinated, of medium-sized quartz grains, fairly roughly finished; aperture a low slit at the base of the ultimate chamber.

Dimensions: (in mm)

	Max Diam	Min Diam	Width
specimen A	0.35	0.28	0.15
Figured specimen B	0.28	0.24	0.14
Figured specimen C	0.38	0.28	0.15
Figured specimen D	0.31	0.28	0.14

Remarks: Haplophragmoides sp. 5-61 differs from H. sp. cf. H. tryssa Loeblich and Tappan in being considerably larger, possessing more chambers in the ultimate whorl, and having a more coarsely agglutinated wall.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
specimen A	57231	051363	90.0
Figured specimen B	57232	"	"
Figured specimen C	57233	"	"
Figured specimen D	57234	"	"

Occurrence: Haplophragmoides sp. 5-61 occurs in small numbers in a single suite located 90 meters above the base of the Lower Member.

Genus Cribrostomoides Cushman, 1910

Cribrostomoides canui (Cushman)

Pl. 10, figs. 3-14, Pl. 11, figs. 1-3

Haplophragmoides canui CUSHMAN, 1930, p. 133, Pl. 4, figs. 1a-b; CUSHMAN and GLAZEWSKI, 1949, p. 4, Pl. 1, fig. 3; TAPPAN, 1955, p. 42, Pl. 9, figs. 11-15.

?Cribrostomoides canui (Cushman) GORDON, 1962, p. 521, text-fig. 1, fig. 1.

Cribrostomoides canui (Cushman) GORDON, 1965, p. 833, text-fig. 1, figs. 1-7.

Ammobaculites canui (Cushman) GORDON, 1967, p. 449, Pl. 1, fig. 1.

Cribrostomoides canui (Cushman) DAIN, 1972, p.   , Pl. VII, fig. 3,4; SOUAYA, 1976, p. 267, Pl. 2, fig. 1.

Material: Several hundred, poor to very well preserved tests.

Description: Test free, large, robust, periphery rounded; planispirally coiled, involute, biumbilicate; 8 to 9 chambers in ultimate whorl; chambers strongly inflated, increasing very gradually in size as added; sutures thickened, straight, radiate, very slightly to non-depressed; wall finely arenaceous with much cement, smoothly finished; aperture areal, centrally placed, raised about 1/3 of way above base of terminal face, ovate to slightly crescentic in shape, commonly obscured.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Hypotype A	0.80	0.65	0.45
Hypotype B	1.23	1.10	0.75
Hypotype C	0.78	0.68	0.43
Hypotype D	0.70	0.54	0.38
Hypotype E	1.70	1.50	0.75
Hypotype F			
Hypotype G			

Remarks: Forms referable to *Cribrostomoides canui* (Cushman) are an important faunal element throughout the Lower Member of the Husky Formation at Martin Creek, and variability in test size is quite pronounced, even within the same suite. Partial thin sections of the tests of selected specimens demonstrate quite clearly that the aperture is areal, rather than basal in nature, and that some forms even possess a raised lip encircling the aperture.

Haplophragmoides inflatigrandis Chamney 1969 from the Barremian of the Aklavik Range closely resembles *C. canui* in most respects, and could probably be considered a juvenile form or even a junior synonym of the latter.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Hypotype A	57235	051308	7.5
Hypotype B	57236	"	"
Hypotype C	57237	"	"
Hypotype D	57238	"	"
Hypotype E	57239	"	"
Hypotype F	57240	"	"
Hypotype G	57367		

Occurrence: Specimens referable to *Cribrostomoides canui* occur in large numbers throughout the Lower Member of the Husky Formation at Martin Creek.

Cribrostomoides goodenoughensis (Chamney)

Pl. 9, figs. 1-14, Pl. 10, figs. 1-2

Haplophragmoides goodenoughensis CHAMNEY, 1969, p. 23, Pl. IV, figs. 5, 6.

Haplophragmoides coronis CHAMNEY, 1969, p. 25, Pl. V, figs. 4, 5.

Haplophragmoides (?) *canuiformis* DAIN, 1972, p. , Pl. VIII, fig. 2, *non* fig. 3.

?*Haplophragmoides goodenoughensis* Chamney SOUAYA, 1976, p. 267, Pl. 2, fig. 6.

Material: Abundant, mostly very well preserved.

Description: Test free, large, planispiral, slightly compressed; semi-evolute, biumbilicate; periphery rounded to moderately lobate; proloculus commonly megalospheric, though microspheric individuals do occur; consisting of 2.5? to 3 whorls, with 9 to 13 chambers in the ultimate whorl; chambers roughly triangular in cross-section with rounded angles, somewhat inflated, increasing gradually in size as added; sutures straight, radiate thickened, becoming depressed near the umbilical area then rising over "umbilicus" to form "nodes" - these nodes commonly form a prominent ring around the umbilical plug, which is itself depressed, wall finely arenaceous with much cement, smoothly finished; aperture areal, ovate to slightly oblong in shape, raised slightly above the base of the septum, commonly with a bordering lip.

Dimensions:

	Max Diam	Min Diam	Thickness
Hypotype A	0.83	0.70	0.38
Hypotype B	0.80	0.70	0.35
Hypotype C	0.78	0.75	0.40
Hypotype D	0.70	0.58	0.35
Hypotype E			
Hypotype F	0.54	0.50	0.30
Hypotype G	0.58	0.48	0.30

Remarks: Haplophragmoides goodenoughensis Chamney was originally described on the basis of rather poorly preserved (crushed and highly siliceous) material from the Lower Barremian of the Aklavik Range. Chamney noted (Chamney, 1969, p. 24) that forms similar to H. goodenoughensis occur in the Upper Jurassic to Neocomian Deer Bay Formation in the Canadian Arctic Archipelago, giving the species a broad stratigraphic range. Abundant, beautifully preserved specimens, of what is believed to be a conspecific form, occur throughout the Lower Member of the Husky Formation in the Aklavik Range. Detailed study of this material necessitates a generic reassignment of H. goodenoughensis.

Examination of well preserved (commonly pyritized) tests of H. goodenoughensis under water through transmitted light seems to indicate that the position of the aperture is areal rather than basal. Partial thin-sectioning of tests confirmed that the areal aperture is surrounded by a fairly distinct bordering lip. The shape of the aperture varies from oval to somewhat elongate. The presence of a raised, lipped, aperture necessitates the reassignment of H. goodenoughensis to the genus Cribrostomoides Cushman.

About 75% of specimens studied via the partial thin-section technique possess a megalospheric proloculus of a fairly large proportion (75% of tests). These same forms also possess fairly well developed septal nodes and the "umbilical ring" referredto by Chamney (op. cit. p. 23, 25). The presence of a large proloculus suggests an explanation for these peculiar septal nodes, if the general shape of the chambers is taken into account. As aforementioned, the chambers are roughly triangular (almost crescentic) in cross-section and strongly overlap the earlier whorls. When a megalospheric proloculus is present the tapering basal portions of each chamber are forced to rise as they approach the umbilicus. This causes a small node to form at the ends of the chambers where the septa meet. Stacking of successive chambers causes the septal node to become further accentuated. Because C. goodenoughensis is slightly evolute and the chambers do not overlap completely, the septal node tends to migrate away from the umbilical depression as each new chamber is added.

The septa (and hence the sutures) in C. goodenoughensis are strongly thickened and less susceptible to deformation than the chamber walls themselves. Since all sutures meet around the umbilical plug, this serves as another means of accentuating the umbilical ring already present due to the megalospheric proloculus. Crushing the test laterally combines the effects of the above and makes the ring of septal nodes even more apparent.

Microspheric forms studied by the thin-section technique seem to possess a much less well-developed umbilical ring, though the feature is still present. Possibly the meeting of the thick sutures around the umbilicus is already enough to generate some sort of septal nodes. The distinguishing of micro- from megalo- spheric forms without thin-sectioning the specimen is rather difficult.

Chamney separated his H. goodenoughensis from H. coronis on the basis of somewhat smaller dimensions and fewer chambers in the ultimate whorl of the latter. In all other respects the forms are similar and from population studies of Husky C. goodenoughensis, it is suggested that H.

coronis is probably a juvenile form of the latter.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Hypotype A	57241	051329	39.0
Hypotype B	57242	"	"
Hypotype C	57243	"	"
Hypotype D	57244	"	"
Hypotype E	57245	"	"
Hypotype F	57246	051326	36.0
Hypotype G	57247	"	"

Occurrence: *Cribrostomoides goodenoughensis* (Chamney) occurs in large numbers throughout the entire Lower Member of Martin Creek.

Cribrostomoides sp. cf. *C. mirandus* Dain

Pl. 9, figs. 15-20

?*Cribrostomoides mirandus* DAIN, 1972, p. , Pl. VIII, figs. 4, 5.

Material: Abundant, generally very well preserved.

Description: Test free, medium-sized, robust, planispirally coiled; completely involute, biumbilicate; periphery rounded; 5 to 6 chambers in ultimate whorl; chambers inflated, increasing very gradually in size as added; sutures straight, radiate, very slightly thickened, only slightly depressed; wall finely arenaceous with moderate amount of cement, smoothly finished; aperture areal, oval to slightly crescentic, raised about 1/3 of the way above base of septum; commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.54	0.50	0.35
Figured specimen B	0.53	0.45	0.30
specimen C	0.49	0.43	0.28
specimen D	0.56	0.49	0.35
specimen E	0.48	0.40	0.30
speicmen F	0.38	0.33	0.28

Remarks: *Cribrostomoides* sp. cf. *C. mirandus* Dain is similar in size and general appearance to *Haplophragmoides kingakensis* Tappan and *H. duoflatis* Chamney. It differs from the former in having a more rounded periphery, less indented sutures, and a more finely arenaceous wall. It differs from the latter only in being slightly larger, so that it is possible that the two forms are conspecific. *C.* sp. cf. *C. mirandus* also closely resembles *C. dolininae* Bulynnikova, though it appears from illustrations of the latter that it is some form of *Recurvoides* as both the holotype and paratype possess an asymmetrical coil. This difference notwithstanding, it is surprising that Dain and Bulynnikova made no attempt to establish criteria by which these very similar forms could be distinguished from each other.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57248	051329	39.0
Figured specimen B	57249	051329	39.0
specimen C	57250	"	"
specimen D	57251	051326	36.0
specimen E	57252	051326	36.0
specimen F	57253	"	"

Occurrence: *Cribrostomoides* sp. cf. *C. mirandus* Dain occurs throughout the basal two-thirds of the Lower Member at Martin Creek.

Genus Evolutinella Myatliuk, 1971

Evolutinella sp. 5-25

Pl. 11, figs. 4-12

Material: Abundant, generally very well preserved.

Description: Test free, medium-sized, compressed, planispirally coiled (may be slightly streptospirally coiled in the earlier portion), almost totally evolute; biumbilicate; periphery rounded; umbilical areas depressed; consisting of 3 to 4 whorls, with 13 to 14 (and rarely 15) chambers in the ultimate whorl; chambers numerous, rounded triangular in cross-section (almost crescentic), not inflated, expanding very gradually as added; sutures straight, radiate, moderately thickened, very slightly to non-depressed; in certain specimens a ring of septal nodes may be developed around the umbilical depression; wall very finely arenaceous with much cement, smoothly finished; aperture areal, a crescentic slit raised somewhat above the base of the septum, sometimes with a bordering lip; generally obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.65	0.54	0.24
Figured specimen B	0.86	0.70	0.34
Figured specimen C	0.63	0.60	0.28
specimen D	0.63	0.61	0.25
specimen E	0.59	0.50	0.24
specimen F	0.50	0.48	0.18

Remarks: The species is tentatively assigned to the genus Evolutinella rather than the genus Trochamminoides because of the nature and position of the aperture: areal with a bordering lip rather than basal and slit-like. Studies of specimens under water through reflected light reveal that in some individuals the early whorls may have slightly streptospiral coiling. If this becomes so pronounced as to be quite noticeable, the forms are classified under the name Recurvoides sp. 5-10-B. It is felt that specimens belonging to Evolutinella sp. 5-25 and Recurvoides sp. 5-10-B form a complete series from one end member to the other. [Further details are discussed in remarks section of the latter species].

Evolutinella sp. 5-25 is similar in overall appearance to Cribrostomoides goodenoughensis (Chamney), but differs from the latter in being somewhat smaller, having a more strongly compressed test, and possessing more numerous chambers in the ultimate whorl. In addition, E. sp. 5-25 is more evolute, and some specimens show a tendency to slight streptospiral coiling in the early portions.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57254	051326	36.0
Figured specimen B	57255	051326	36.0
Figured specimen C	57256	"	"
specimen D	57257	"	"
specimen E	57258	"	"
specimen F	57259	"	"

Occurrence: Evolutinella sp. 5-25 occurs quite commonly in the basal two-thirds of the Lower Member at Martin Creek.

Genus *Trochamminoides* Cushman, 1910

Trochamminoides sp. 6-13

Pl. 21, figs. 24-28

Material: Rather uncommon; about 40 tests available in adequate state of preservation.

Description: Test free, small, discoidal; rather strongly compressed, periphery somewhat lobulate; coiling planispiral, completely evolute; consisting of spherical proloculus (0.012 to 0.018 mm in diameter) followed by 3 to 3.5 whorls; 3 to 4 chambers in initial whorl, increasing to 6 or 7 in ultimate whorl; chambers rectangular with rounded corners; strongly compressed; sutures distinct, very slightly depressed to flush, arched obliquely against direction of coiling; wall very finely arenaceous with much cement, rather smoothly finished; aperture a low arch at the base of the ultimate chamber, commonly obscured.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.36	0.30	0.10
specimen B	0.33	0.28	0.09
Figured specimen C	0.28	0.26	0.05
Figured specimen D	0.29	0.28	0.05
specimen E	0.33	0.29	0.08
specimen F	0.30	0.21	0.08
specimen G	0.31	0.26	0.10

Remarks: *Trochamminoides* sp. 6-13 is a very distinctive species, not likely to be mistaken for any other form. *Haplophragmoides barrowensis* Tappan is nearly as evolute, but is twice the size and possesses more numerous (10 to 12 versus 6 to 7) inflated and equant chambers in the ultimate whorl. Due to its compressed, discoidal nature, *T.* sp. 6-13 is very susceptible to crushing and many tests are twisted or otherwise deformed.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57260	051379	131.0
specimen B	57261	051379	131.0
Figured specimen C	57262	"	"
Figured specimen D	57263	"	"
specimen E	57264	051381	137.0
specimen F	57265	"	"
specimen G	57266	"	"

Occurrence: Trochamminoides sp. 6-13 is restricted in occurrence to beds located 125.0 to 143.0 m above the base of the Lower Member. These shales are of probable late Kimmeridgian age.

Subfamily RECURVOIDINAE Alekseitchuk-Mitskevich, 1973

Genus Recurvoides Earland, 1934

Recurvoides canningensis (Tappan)

Pl. 11, figs. 13-26

Trochammina canningensis TAPPAN, 1955, p. 49, Pl. 14, figs. 15, 17-19, non fig. 16.

?Trochammina canningensis Tappan SOUAYA, 1976, p. 274, Pl. 2, fig. 2a-b.

Material: Very abundant, several hundred generally well preserved tests available for study.

Description: Test free, small to medium-sized, robust, globular; coiling indistinctly streptospiral, exact nature difficult to ascertain, but does not appear to be trochospiral; consisting of 6 to 14 chambers arranged in 1.5 to 2.5 closely embracing (i.e. strongly overlapping) whorls; chambers globular, strongly inflated, expanding rapidly in size as added, strongly overlapping; sutures distinct, somewhat thickened, strongly depressed; wall composed of fine to medium-sized quartz grains with considerable cement, in general somewhat roughly finished, aperture an arched slit at the base of the ultimate chamber, centrally positioned, commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Hypotype A	0.34	0.33	0.30
Hypotype B	0.34	0.31	0.30
Hypotype C	0.33	0.33	0.28
Hypotype D	0.63	0.55	0.45
Hypotype E	0.48	0.42	0.40
Hypotype F	0.48	0.43	0.38

Remarks: The forms ascribed herein to Recurvoides canningensis (Tappan) compare favourably with most of the specimens described by Tappan as Trochammina canningensis. Generic assignment of this form is rendered difficult due to the closely overlapping, rapidly expanding chambers which quickly obscure the true nature of the coiling in the earlier whorls. Close study of many exceptionally well preserved specimens suggests, however, that the coiling is distinctly streptospiral rather than trochospiral in actual design.

Recurvoides canningensis (Tappan) differs from Trochammina (?) ex. gr. canningensis Tappan, Dain (1972) in being about twice as large, containing more numerous, more greatly inflated chambers, and a greater number of whorls.

It is likely that there may be more than one species present within the Husky R. canningensis species group, as there exist wide variations in test size, wall grain size and degree (i.e. amount of) of cementation between the various specimens. These factors await further, more detailed studies.

Types:

	GSC Type No.	GCS Field No.	H.A.B. (Meters)
Hypotype A	57267	051326	36.0
Hypotype B	57268	051326	36.0
Hypotype C	57269	051326	36.0
Hypotype D	57270	051324	33.0
Hypotype E	57271	051312	13.5
Hypotype F	57272	051312	13.5

Occurrence: *Recurvoides canningensis* (Tappan) occurs commonly throughout the Oxfordian to Kimmeridgian portion of the Lower Member of the Husky Formation.

Recurvoides sublustris Dain

Pl. 12, figs. 15-20.

Recurvoides sublustris DAIN, 1972, p. 57, Pl. XII, figs. 3-6.

Material: Fairly common, in general very well preserved.

Description: Test free, medium-sized, compressed; ovate in outline, periphery rounded; streptospirally coiled; consisting of approximately 2 to 3 whorls; about 2 whorls visible on "dorsal" side, only ultimate whorl visible on "ventral" side; plane of coiling shifts approximately 30° - 45° in each succeeding volution; chambers numerous, not inflated, initially quadrate, later becoming more 'wedge-shaped' (i.e. tapering from periphery inward), increasing gradually in size as added, about 7 to 10 in ultimate whorl; sutures distinct, thickened, straight and radial, not depressed (i.e. flush with surface of test); wall finely arenaceous with much cement, fairly smoothly finished; aperture ovate, areal, raised about 1/3 of way above base of septum, with a distinct bordering lip, commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Hypotype A	0.50	0.38	0.30
Hypotype B	0.58	0.43	0.25
Hypotype C	0.55	0.43	0.25
Hypotype D	0.60	0.45	0.25

Remarks: The specimens of Recurvoides sublustris recovered from the Lower Member of the Husky Formation agree well with the forms figured by Dain (1972), with the exception that the former have somewhat fewer chambers in the ultimate whorl than do the latter.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Hypotype A	57273	051324	33.0
Hypotype B	57274	051326	36.0
Hypotype C	57275	051329	39.0
Hypotype D	57276	051329	39.0

Occurrence: Recurvoides sublustris occurs within the Lower Member of the Husky Formation in strata assigned a late Oxfordian to early Kimmeridgian age.

Recurvoides sp. cf. R. sublustris Dain

Pl. 12, figs. 11-14, 21.

?Recurvoides sublustris DAIN, 1972, p. 57, Pl. XII, figs. 3-6.

Material: Fairly common, generally very well preserved.

Description: Test free, large, compressed, stoutly ovate in outline; periphery rounded; streptospirally coiled; consisting of approximately

2.5 to 4 whorls; about 2 to 3 whorls visible on the "dorsal" side, side, 1 to 2 whorls visible on the umbilical side; plane of coiling probably shifts about 30° or less in each succeeding volution; chambers numerous, 8 to 10 in ultimate whorl (?megalospheric), 10 to 14 in ultimate whorl (?microspheric); chambers moderately inflated, initially quadrate, in later whorls becoming more 'wedge-shaped' (i.e. tapering from the periphery inwards), increasing gradually in size as added; sutures distinct, thickened straight and radiate, not depressed (i.e. flush with the surface of the test); wall finely arenaceous with much cement, smoothly finished; aperture ovate, areal raised above the base of the septum, commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.83	0.63	0.33
specimen B	0.80	0.58	0.30
Figured specimen C	0.75	0.58	0.28
Figured specimen D	0.65	0.50	0.23
specimen E	0.60	0.45	0.23
specimen F	0.50	0.40	0.23
specimen G	0.65	0.48	0.18
specimen H	0.38	0.40	0.19
specimen I	0.48	0.38	0.20
specimen J	0.50	0.38	0.18

Remarks: Recurvoides sp. cf. R. sublustris Dain is similar in general appearance to R. sublustris sensu stricto but differs in possessing a more gently streptospiral mode of coiling and in having more numerous chambers in the ultimate whorl (10 to 14 in the former as compared with 7 to 10 in the latter).

The Husky specimens show a fair degree of variation in test size, ranging from 0.40 mm to 0.80 mm. The presence of microspheric and megalospheric generations is inferred from the number of chambers in the ultimate whorl, as the proloculus itself was not actually seen in any of the specimens.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57277	051307	6.0
specimen B	57278	051307	6.0
Figured specimen C	57279	"	"
Figured specimen D	57280	"	"
specimen E	57281	029107	1.5-6.1
specimen F	57282	029107	1.5-6.1
specimen G	57283	"	"
specimen H	57284	"	"
specimen I	57285	"	"
specimen J	57286	"	"

Occurrence: Recurvoides sp. cf. R. sublustris occurs in small numbers in strata of ? early Oxfordian age in the basal portion of the Lower Member. This makes these specimens somewhat older than R. sublustris sensu stricto which occurs in the early Kimmeridgian of western Siberia.

Recurvoides disputabilis Dain

Pl. 11, figs. 27-39

Recurvoides disputabilis DAIN, 1972, p. 55, Pl. X, figs. 6, 7.

Recurvoides disputabilis disputabilis DAIN, 1972, p. 55,Pl. XI, figs. 1-4.

Recurvoides disputabilis plana DAIN, 1972, p. 56, Pl. XI, figs. 5, 6; Pl. XII, figs. 1-2.

?Recurvoides sp. cf. R. disputabilis planus Dain, SOUAYA, 1976, p.267, Pl. 6, figs. 4a-c.

Recurvoides sp. cf. *R. disputabilis disputabilis* Dain, SOUAYA, 1976, p. 267, Pl. 7, figs. 4a-c.

Material: Fairly common, generally well preserved.

Description: Test free, medium-sized, rounded, margins rounded; streptospirally coiled; consisting of about 1.5 to 2.5 whorls; ultimate and part of penultimate whorl visible on "dorsal" side, the latter sometimes forming a distinct, 'knob-like' projection; only ultimate whorl visible on "ventral" side; plane of coiling shifts abruptly - about 45° to 60° - in each successive volution; about 6 to 8 chambers in ultimate whorl; chambers slightly inflated, quadrangular in early whorls with tendency to become 'wedge-shaped' (i.e. tapering inwards from periphery) in later whorls, increasing very gradually in size as added; sutures distinct, straight and radiate, not depressed (i.e. flush with surface of test); wall composed of fine to medium quartz grains, with much cement, fairly smoothly finished; aperture ovate, areal, raised slightly above base of septum.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Hypotype A*	0.55	0.53	0.35
Hypotype B	0.35	0.30	0.25
Hypotype C	0.43	0.35	0.25
Hypotype D	0.48	0.48	0.33
Hypotype E	0.45	0.43	0.28
Hypotype F	0.45	0.40	0.35
Hypotype G	0.48	0.40	0.35

* indicates damaged specimen

Remarks: Dain's reasons for erecting two subspecies for *Recurvoides disputabilis* (*R. disputabilis disputabilis* and *R. disputabilis plana*) are not clear. Apparently the sole criterion for distinguishing the two subspecies is that *R. disputabilis plana* has a "slightly smaller, more symmetrical test.". Additionally, the two forms apparently succeed each other statigraphically: R. disputabilis disputabilis is Late Oxfordian while R. disputabilis plana is Early Kimmeridgian. In the Lower Member of the Husky Formation forms referable to both subspecies (or rather to the original R. disputabilis species description) occur together in strata of late Kimmeridgian to ?mid Portlandian age. Because of the rather sketchy criteria cited above, no attempt has been made to sort out the two subspecies in the present study.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Hypotype A	57287	051367	95.0
Hypotype B	57288	"	"
Hypotype C	57289	"	"
Hypotype D	57290	051369	101.0
Hypotype E	57291	051370	104.0
Hypotype F	57292	051411	197.0
Hypotype G	57293	051412	200.0

Occurrence: Recurvoides disputabilis Dain occurs in small numbers, rather erratically, throughout the upper 120 m of the Lower Member of the Husky Formation, in strata of ?late Kimmeridgian to early and ?mid Portlandian age.

Recurvoides sp. cf. R. scherkalyensis Levina

Pl. 12, figs. 1-10

Recurvoides scherkalyensis LEVINA, 1962, p. , Pl. , figs.

?Recurvoides scherkalyensis Levina DAIN, 1972, p. , Pl. IX, fig. 8, Pl. X, fig. 1.

Material: Fairly common, generally well preserved.

Description: Test free, large, broadly rounded, stout; periphery rounded, streptospirally coiled; consisting of 2 to 2.5 whorls; approximately 2 whorls visible on "dorsal" side, only ultimate whorl visible on "ventral" side; about 9 to 10 chambers in ultimate whorl; chambers subquadrate, slightly tapering inward from the periphery, increasing gradually in size as added; sutures distinct, thickened, straight and radiate, not depressed (i.e. flush with surface of test); wall composed of finely granular quartz, with much cement, fairly smoothly finished; aperture ovate, areal, raised slightly above base of septum; commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.80	0.60	0.40
Figured specimen B	0.68	0.60	0.25
Figured specimen C	0.65	0.55	0.25
Figured specimen D	0.57	0.50	0.28
specimen E	0.63	0.53	0.25
specimen F	0.73	0.60	0.33

Remarks: *Recurvoides* sp. cf. *R. scherkalyensis* broadly resembles *R. scherkalyensis* Levina, but the Husky forms are somewhat larger and more robust. It differs from *R. gryci* (Tappan) in being somewhat larger, possessing fewer whorls, having fewer earlier volutions visible on the "dorsal" side and having fewer chambers in the ultimate whorl.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57294	051313	15.0
Figured specimen B	57295	051313	15.0
Figured specimen C	57296	051315	18.0
Figured specimen D	57297	051315	18.0
specimen E	57298	051321	27.0
specimen F	57299	051343	60.0

Occurrence: *Recurvoides* sp. cf. *R*. *scherkalyensis* occurs in small numbers in the basal 30 m of the Lower Member of the Husky Formation at Martin Creek, in strata of ?early to mid Oxfordian age. In western Siberia, *R*. *scherkalyensis* sensu stricto occurs in Late Callovian and Early Oxfordian strata.

Recurvoides sp. *5-4*

Pl. 12, figs. 34-39; Pl. 13, figs. 1-6

Recurvoides gryci (Tappan) DAIN, 1972, p. , Pl. IX, figs. 1-7.

non Trochammina gryci TAPPAN, 1955, p. 50, Pl. 14, figs. 12-14.

Material: Rare, about 15 specimens in an adequate state of preservation.

Description: Test free, large, "globular", periphery rounded; consisting of 3 to 4 whorls arranged in gentle streptospiral coil, such that coiling appears to be almost trochospiral; chambers numerous, rounded triangular in cross-section, not inflated, increasing gradually in size as added, 8 to 11 in ultimate whorl; all chambers of the approximately 4 whorls visible "dorsally", only chambers of the ultimate whorl visible "ventrally"; sutures straight, radiate, strongly thickened, flush with surface of test; wall finely arenaceous with much cement, smoothly finished; aperture ovate, areal, raised about 1/3 of way above base of septum, with a bordering lip.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.93	0.80	0.43
Figured specimen B	0.60	0.55	0.45
Figured specimen C	0.55	0.48	0.40
Figured specimen D	0.88	0.85	0.40
specimen E	0.78	0.60	0.45
specimen F	0.85	0.70	0.40
specimen G	0.65	0.60	0.43

Remarks: Dain's reasons for reassigning Trochammina gryci Tappan to the genus Recurvoides are not clear. From the illustrations and descriptions provided by Tappan (1955), her form would seem to clearly belong to the genus Trochammina. Whether Dain assumed that the gentle streptospiral coiling found in her "Recurvoides gryci" was identical to the apparent trochospiral coiling found in T. gryci is not known. However, it is herein assumed that her reassignment is taxonomically invalid and her Recurvoides gryci (Tappan) is herein designated as Recurvoides sp. 5-4. Only re-examination of Tappan's type material would confirm or deny the validity of Dain's reassessment.

Within the forms underconsideration there appear to exist both microspheric and megalospheric variants, with the former predominating.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57300	051306	4.5
Figured specimen B	57301	051306	4.5
Figured specimen C	57302	"	"
Figured specimen D	57303	"	"
specimen E	57304	"	"
specimen F	57305	051305	3.0
specimen G	57306	051305	3.0

Occurrence: Recurvoides sp. 5-4 is restricted in occurrence to the basal 5 m of the Lower Member of the Husky Formation at Martin Creek, to strata of ?early Oxfordian age. This shows good agreement with Dain's forms which come from ?mid to upper Callovian of western Siberia.

Recurvoides sp. 5-10-A

Pl. 13, figs. 7-13, 20

Material: About 25 well preserved tests.

Description: Test free, medium-sized, ovate and elongated, generally compressed, though it appears to be gently triangular in cross-section, periphery rounded; streptospirally coiled; plane of coiling shifts abruptly (45° to 60°) with each successive volution; approximately 2.5 to 3 whorls present with 8 to 10 chambers in ultimate whorl; chambers not inflated, generally somewhat longer than broad, expanding very gradually in size as added; sutures distinct, may be somewhat thickened though this is not always the case, straight, radiate, not depressed (i.e. flush with surface of test); wall composed of microgranular quartz grains with considerable cement, smoothly finished; aperture ovate, areal, elevated somewhat above base of septum, commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.73	0.44	0.35
Figured specimen B	0.73	0.40	0.35
specimen C	0.65	0.40	0.33
Figured specimen D	0.69	0.44	0.33
specimen E	0.53	0.35	0.23
specimen F	0.53	0.35	0.25

Remarks: *Recurvoides* sp. *5-10-A* is distinctly different from all other specimens of *Recurvoides* to date described from the boreal Upper Jurassic. It bears some similarity to *R. sublustris* Dain but varies from the latter in being much more elongate, possessing a more ovate to triangular cross-section and having fewer chambers in the ultimate whorl.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57307	051312	13.5
Figured specimen B	57308	051312	13.5
specimen C	57309	"	"
Figured specimen D	57310	051311	12.0
specimen E	57311	051324	33.0
specimen F	57312	051324	33.0

Occurrence: *Recurvoides* sp. *5-10-A* occurs in small quantities (up to 10 specimens per sample) in the basal 35 m of the Lower Member of the Husky Formation, in strata of ?mid to late Oxfordian age.

Recurvoides sp. *5-10-B*

Pl. 12, figs. 22-33

Material: Abundant, about 100 tests in adequate state of preservation.

Description: Test free, medium to large sized, rounded; compressed; periphery rounded; gently streptospirally coiled, such that plane of coiling shifts less than 15° with each succeeding volution, producing a nearly planispiral (*Cribrostomoides*-like) test; consisting of 3 to 3.5 whorls, commonly nearly all whorls visible on both "dorsal" and "ventral" sides, such that these are difficult to distinguish, less commonly all whorls visible on "dorsal" side and only ultimate whorl visible on "ventral" side; chambers numerous, semi-circular in cross-section, increasing very gradually in size as added, commonly 12 to 17 in ultimate whorl; sutures distinct, thickened, straight and radiate, not depressed (i.e. flush with surface of wall); wall very finely arenaceous with much cement, smoothly finished; aperture ovate, areal, situated centrally and elevated slightly above base of septum, with a distinct bordering lip.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.78	0.73	0.23
Figured specimen B	0.60	0.53	0.20
Figured specimen C	0.80	0.71	0.35
Figured specimen D	0.65	0.65	0.20
specimen E	0.73	0.55	0.25
specimen F	0.63	0.55	0.26
specimen G	0.50	0.45	0.18
specimen H	0.53	0.45	0.18

Remarks: Recurvoides sp. 5-10-B is most closely allied with Evolutinella sp. 5-25 and commonly the two genera coexist in the same suites. It differs from other Recurvoides in possessing a very shallow streptospiral coil which gives it a nearly planispiral appearance and also in possessing much more numerous chambers in the ultimate whorl.

Recurvoides sp. 5-10-B can be traced in continuous series (i.e. as the shift in the plane of coiling with each successive volution approaches 0°) into Evolutinella sp. 5-25 (the streptospiral coiling in effect becomes planispiral coiling) and vice versa. What causes this instability is not wholly clear at the present time. Partial thin-section studies of a select few well-preserved specimens with a "minor" degree of streptospiral coiling indicates, more often than not, that the proloculus is megalospheric. Therefore, in these cases the reversion to streptospiral coiling may well represent an attempt by the animal to accommodate the larger proloculus. If this is assumed to be the case throughout, then the foraminiferid animal could be seen to adopt the *Evolutinella* sp. *5-25* morphological form for the agamont test and the *Recurvoides* sp. *5-10-B* heteromorph for the gamont form.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57313	051312	13.5
Figured specimen B	57314	051312	13.5
Figured specimen C	57315	"	"
Figured specimen D	57316	051329	39.0
specimen E	57317	051329	39.0
specimen F	57318	"	"
specimen G	57319	051353	75.0
specimen H	57320	051353	75.0

Occurrence: *Recurvoides* sp. *5-10-B* is found in fair abundance in the basal 75 m of the Lower Member of the Husky Formation on Martin Creek, in strata of a general ?early Oxfordian to Kimmeridgian age.

Recurvoides sp. *5-11*

Pl. 21, figs. 9-23

Material: Common, several hundred tests in excellent state of preservation.

Description: Test free, small, compressed; streptospirally coiled in the initial portion [i.e. there is a distinct and abrupt shift in the plane of coiling within the early whorls of the test], becoming progressively less so, such that the final whorls appear nearly planispiral in design; chambers numerous, slightly inflated, expanding gradually as added, 12 to 14 in ultimate whorl; wall very finely agglutinated, composed of microgranular quartz grains with much siliceous cement, smoothly finished; aperture areal, raised somewhat above the base of the septum; bordering lip - if present - not discernible due to small size of specimens and preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.30	0.30	0.075
Figured specimen B	0.28	0.23	0.063
Figured specimen C	0.26	0.23	0.075
specimen D	0.23	0.23	0.075
specimen E	0.26	0.25	0.075
Figured specimen F	0.23	0.16	0.063
Figured specimen G	0.20	0.18	0.063

Remarks: Recurvoides sp. 5-11 differs from all other species of Recurvoides occurring in the Lower Member of the Husky Formation by virtue of its smaller size, greater compression (i.e. thinner test) and larger number of chambers per whorl.

There appears to be a wide degree of variance in the degree or amount of streptospiral coiling in the initial portions of some specimens, such that some forms could equally well be placed in the genus Evolutinella Myatliuk. However, it is obvious that all the heteromorphs belong in the same species group and no finer distinction of these forms is made.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57321	051312	13.5
Figured specimen B	57322	051313	15.0
Figured specimen C	57323	"	"
specimen D	57324	"	"
specimen E	57325	"	"
Figured specimen F	57326	051326	36.0
Figured specimen G	57327	"	"

Occurrence: Recurvoides sp. 5-11 occurs quite commonly throughout the basal two-thirds of the Lower Member of Martin Creek.

Recurvoides sp. 7-23

Pl. 13, figs. 14-19, 21-23

Material: About 25 well preserved specimens.

Description: Test free, medium-sized globular in juvenile stage, becoming somewhat elongate in the adult forms; periphery rounded; loosely streptospirally coiled; consisting of 1.5 to 2.5 whorls; normally all whorls visible on "dorsal" side, only ultimate whorl visible on "ventral" side so that the test takes a definitely trochoid appearance; plane of coiling shifts gently (probably less than 30°) in each successive volution; about 5 to 8 chambers in ultimate whorl; chambers quadrate, slightly inflated, increasing gradually in size as added; sutures distinct, straight, radiate, not depressed (i.e. flush with surface of wall); wall composed of fine to medium sized quartz grains bound with considerable cement, somewhat roughly finished; aperture ovate, areal, centrally located and elevated somewhat above base of septum; commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Thickness
Figured specimen A	0.40	0.35	0.33
Figured specimen B	0.56	0.50	0.35
Figured specimen C	0.48	0.38	0.30
specimen D*	0.38	0.30	0.33

* megalospheric juvenile

Remarks: Recurvoides sp. 7-23 closely resembles R. eotrochus Dain (1972) in general design, but is somewhat larger in overall dimensions and lacks the open umbilical area of the latter. It differs from the Recurvoides disputabilis Dain (1972) species group in having a more trochospiral aspect of coiling such that all previous whorls are visible on the "dorsal" side.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57328	051414	206.0
Figured specimen B	57329	051414	206.0
Figured specimen C	57330	"	"
specimen D	57331	"	"

Occurrence: Recurvoides sp. 7-23 occurs in modest numbers (10 to 15 specimens) in the uppermost 10 m of the Lower Member at Martin Creek, in strata of mid or late Portlandian age. Individual specimens of similar aspect range down into ?mid to late Kimmeridgian strata.

Subfamily LITUOLINAE de Blainville, 1825

Genus Ammobaculites Cushman, 1910

Ammobaculites alaskensis Tappan

Pl. 14, figs. 1-6, 9-12

Ammobaculites alaskensis TAPPAN, 1955, p. 45, Pl. 12, figs. 1, 4, 5, 9; non figs. 2, 3, 6-8, 10; SOUAYA, 1976, p. 268, Pl. 5, fig. 3.

Material: Abundant, several hundred poorly to very well preserved tests.

Description: Test free, large, robust; early portion planispirally coiled, consisting of (visible) 1 to 1.5 whorls with 4 to 6 chambers in ultimate whorl, chambers strongly inflated, somewhat triangular in outline, increasing gradually in size as added, coil diameter generally 25% to 50% greater than maximum diameter of uniserial portion; later portion uniserial, straight, rectilinear, parallel sided or nearly so, consisting of 2 to 4 chambers; chambers centrally inflated, broader than high (height to width ratio = c. 1 : 1.5), rounded in cross-section, increasing very slowly in size as added; ultimate chamber generally equant, rounded to very slightly pyriform in outline; sutures distinct, somewhat thickened (limbate), slightly constricted, straight, radial in coiled portion, horizontal in uniserial portion; wall moderately to quite coarsely arenaceous, composed mainly of unsorted quartz grains, although glauconite grains, rock fragments and small foraminiferal tests may also be incorporated with much cement, giving a fairly smooth to quite rough finish; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Hypotype A	0.35	0.35	0.50	1.03
Hypotype B	0.38	0.31	0.45	1.05
Hypotype C	0.39	0.39	0.53	0.65
Hypotype D	0.40	0.38	0.55	1.00
Hypotype E	0.35	0.35	0.45	0.73
Hypotype F	0.35	0.33	0.53	1.18
Hypotype G	0.41	0.33	0.50	1.33
Hypotype H	0.50	0.40	0.55	1.48

Max Diam = diameter of first chamber of uniserial portion.
Min Diam = diameter of ultimate chamber of uniserial portion.

Remarks: *Ammobaculites alaskensis* Tappan as originally defined by the latter contains a rather diverse assemblage of forms. *A. alaskensis* as restricted herein is limited to specimens which possess a rather large coiled portion followed by an uniserial portion of 2 to 4 (and in rare instances 5) chambers which are centrally inflated. The sutures are somewhat thickened (limbate), the wall grain size rather coarse, and in most cases, the terminal chamber rounded to slightly pyriform.

Even with this stricter redefinition, there remains a great deal of flexibility. Height of adult specimens ranges from 0.75 to 1.50 mm. The grain size of the walls also fluctuates from specimen to specimen. Ultimate chambers (in adult) can vary from globular to quite severely pyriform.

Ammobaculites alaskensis differs from *A. barrowensis* Tappan in having a more rounded ultimate chamber and being 1/4 to 1/2 the size. It bears some resemblance to *A. validus* Beljaevskaja, but the diagnosis provided for the latter species is too vague to make a legitimate comparison.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Hypotype A	57332	051325	34.5
Hypotype B	57333	"	"
Hypotype C	57334	"	"
Hypotype D	57335	051326	36.0
Hypotype E	57336	"	"
Hypotype F	57337	051411	197.0
Hypotype G	57338	"	"
Hypotype H	57339	"	"

Occurrence: *Ammobaculites alaskensis* Tappan (restr.) and allied forms range throughout the Lower Member of the Husky Formation at Martin Creek.

Ammobaculites alaskensis Tappan (restr.)subsp. 5-5

Pl. 14, figs. 7, 8, 13, 14, 19, 20

Material: Common, generally well preserved.

Description: Test free, large, robust; early portion loosely planispirally coiled, consisting of 6 to 7 chambers, umbilical area depressed, chambers moderately inflated, increasing gradually in size as added; coil diameter generally about 50% to 75% greater than maximum diameter of the uniserial portion, coil comprises about 50% to 67% of the total length of the test; later portion straight, rectilinear, uniserial, consisting of 1 to 2 chambers; chambers centrally inflated, approximately equant to somewhat broader than high, increasing slowly in size as added, ultimate chamber somewhat pyriform in shape; sutures distinct, moderately constricted, radial in coiled portion, straight and horizontal in uniserial portion; wall moderately arenaceous, composed of unsorted quartz grains with considerable cement, fairly smoothly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam uniserial	Max Diam coil	Height
Figured specimen A	0.25	0.50	0.65
specimen B	0.25	0.48	0.48
specimen C	0.28	0.43	0.53
Figured specimen D	0.25	0.38	0.55
Figured specimen E	0.28	0.45	0.70
specimen F	0.33	0.53	0.60

Remarks: Ammobaculites alaskensis Tappan (restr.) subsp. 5-5 is very similar in general form to A. alaskensis Tappan (restr.). It differs in having a larger (proportionately), less inflated coil which possesses a depressed umbilical area and a poorly developed uniserial portion, which rarely exceeds two chambers in height. The ultimate chamber in the uniserial portion is commonly somewhat elongate to pyriform in shape.

Type:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57340	051307	6.0
specimen B	57341	"	"
specimen C	57342	"	"
Figured specimen D	57343	"	"
Figured specimen E	57344	"	"
specimen F	57345	"	"

Occurrence: Ammobaculites alaskensis Tappan (restr.) subsp. 5-5 is restricted in occurrence to the basal 10 meters of the Lower Member of the Husky Formation, to beds of ?early Oxfordian age.

Ammobaculites sp. cf. A. multiformis Dain

Pl. 15, figs. 7-16, 21-24

?Ammobaculites multiformis DAIN, 1972, p. 63, Pl. XVI, figs. 5-8.

Material: Common, generally well preserved.

Description: Test free, large, robust; early portion loosely planispirally coiled, completely evolute, umbilical areas slightly depressed, consisting of 5 to 7 chambers; chambers equant to somewhat triangular in shape, moderately to strongly inflated, increasing gradually in size as added; coiled portion normally equal to or slightly larger than maximum diameter of uniserial portion, makes up 33% to 50% of test; remainder of test uniserial, axis straight to slightly inclined, consisting of one and rarely two chambers, ultimate chamber strongly inflated, distinctly pyriform in shape; sutures distinct, slightly thickened, strongly constricted (where not interfered with by grains); wall moderately to very coarsely arenaceous, composed of unsorted quartz grains with considerable cement, fairly smoothly to somewhat roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Coil Diam	Height
Figured specimen A	0.30	0.36	0.64
Figured specimen B	0.24	0.38	0.54
Figured specimen C	0.21	0.38	0.79
specimen D	0.33	0.43	0.65
Figured specimen E	0.29	0.35	0.85
Figured specimen F	0.55	0.35	1.25
Figured specimen G	0.34	0.50	0.65

Max Diam = Maximum width of the uniserial portion.

Remarks: Ammobaculites sp. cf. A. multiformis Dain is, as the name implies, an highly variable species. Variation in the grain size of the wall is quite pronounced, with certain forms having a finely agglutinated, smoothly finished surface and other forms being composed of very coarse, ill-fitting grains that obscure and distort the sutures. Several specimens seem to select fine grains for the coiled portion and progressively coarser grains for the uniserial portion. The shape of the chambers in the coiled portion is also quite variable, with different specimens possessing globular or teardrop-shaped or triangular chambers.

A. sp. cf. A. multiformis Dain differs from A. multiformis Dain in having a shorter uniserial portion (1 to 2 versus 2 to 4 chambers), and in possessing a more irregular number of chambers in the coil.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57346	051325	33.0
specimen B	57347	"	"
Figured specimen C	57348	"	"
Figured specimen D	57349	051379	131.0
Figured specimen E	57350	"	"
Figured specimen F	57351	"	"
Figured specimen G	57352	"	"

Occurrence: Ammobaculites sp. cf. A. multiformis Dain occurs in small numbers, rather erratically, throughout all save the basal 30 m of the Lower Member.

Ammobaculites sp. cf. A. multiformis Dain var. 1

Pl. 17, figs. 19-22

Material: About 50 specimens in various states of preservation.

Description: Test free, large, robust; early portion planispirally coiled, biumbilicate, umbilical areas slightly to moderately depressed, consisting of 7 to 10 chambers; chambers elongate-triangular in shape, much broader than high, increasing quite rapidly in size as added, slightly inflated; coil diameter usually 50% to 65% greater than maximum diameter of the uniserial portion, coil occupies about 50% to 75% of the total test length; uniserial portion poorly developed, usually consists of a single chamber which is strongly centrally inflated and rounded to somewhat pyriform in shape; sutures distinct, slightly thickened, moderately constricted, straight; wall moderately to quite coarsely arenaceous, composed of fairly equant quartz grains with abundant cement, fairly roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Coil Diam	Height
Figured specimen A	0.63	0.85	1.08
specimen B*	0.63	0.89	1.00
specimen C	0.43	0.68	0.70
Figured specimen D	0.55	0.78	1.18
Figured specimen E	0.58	0.89	1.08

Max Diam = Maximum diameter of the uniserial portion.
* = Crushed specimen

Remarks: Ammobaculites sp. cf. A. multiformis Dain var. 1 differs from A. sp. cf. A. multiformis Dain in being nearly twice the size of the latter, and possessing more chambers in the coiled portion. Possibly due to the larger size of the specimens, there does not exist the variability in grain size of the wall as there does in A. sp. cf. A. multiformis.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57353	051368	98.0
specimen B	57354	051369	101.0
specimen C	57355	051379	131.0
Figured specimen D	57356	051381	137.0
Figured specimen E	57357	051381	137.0

Occurrence: Ammobaculites sp. cf. A. multiformis Dain var. 1 occurs singly or in small numbers throughout the upper two-thirds of the Lower Member at Martin Crrek.

Ammobaculites sp. cf. A. multiformis Dain var. 2

Pl. 15, figs. 17-20, 25, 26

Material: Common.

Description: Test free, large; early portion planispirally coiled, consisting of 4 to 5 chambers, chambers slightly inflated, increasing gradually in size as added; coiled portion about eoual to or up to 33% greater than maximum diameter of the uniserial portion, makes up about 33% of the whole test; later portion uniserial, consisting of 2 to 3 chambers, chambers centrally inflated, almost equant, though slightly broader than high, ultimate chamber distinctly pyriform; sutures distinct, straight, strongly constricted; wall very coarsely arenaceous, composed of unsorted quartz grains with small amount of siliceous cement, roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Figured specimen A	0.30	0.25	0.38	0.80
Figured specimen B	0.31	0.25	0.33	0.93
Figured specimen C	0.38	0.28	0.45	0.93

Max Diam = Diameter of initial chamber of the uniserial portion.
Min Diam = Diameter of the ultimate chamber of the uniserial portion.

Remarks: *Ammobaculites* sp. cf. *A. multiformis* Dain var. 2 differs from *A.* sp. cf. *A. multiformis* Dain in possessing more chambers in the uniserial portion (2 to 3 versus 1 to 2) which are arranged along a straight rather than an inclined axis. It varies from *A.* sp.cf. *A. multiformis* Dain var. 1 in overall smaller dimensions, fewer chambers in the coiled portion and more numerous chambers in the uniserial portion.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57358	051379	131.0
Figured specimen B	57359	"	"
Figured specimen C	57360	"	"

Occurrence: *Ammobaculites* sp. cf. *multiformis* Dain var. 2 occurs in small numbers in suites 125 to 143 m above the base of the Lower Member.

Ammobaculites sp. cf. *A. venustus* Loeblich and Tappan

Pl. 22, figs. 1-8

?*Ammobaculites venustus* LOEBLICH and TAPPAN, 1950a, p. 42, Pl. 11, figs. 7 - 8b.

Ammobaculites venustus Loeblich and Tappan, WALL, 1960, p. 52, Pl. 8, figs. 8, 9; Pl. 17, figs. 6, 7; BROOKE and BRAUN, 1972, p. , Pl. 8, figs. 58, 59; *non* SOUAYA, 1976, p. 269, Pl. 6, figs. 16, 17.

Material: Several hundred generally well preserved specimens.

Description: Test free, small, not compressed; initial portion planispirally coiled, consisting of 1.5 to 2 closely embracing whorls; proloculus spherical, followed by 5 to 6 chambers which expand rapidly as added in initial whorl, dropping down to 3 to 4 in outer whorl; coiled portion occupies 25% to 33% of the test, diameter of the coil is usually equal to or up to 25% greater than maximum width of the uniserial portion; later portion straight, uniserial, consisting of 2 to 4 (commonly 3) chambers; chambers about equant (height : width ratio = c. 1 : 1), somewhat centrally inflated, expanding very gradually in size as added; ultimate chamber pyriform (regardless of whether specimen is juvenile or adult form); sutures distinct, straight, strongly constricted, horizontal in uniserial portion; wall quite coarsely arenaceous with considerable cement, roughly finished; aperture simple, terminal, rounded, produced on a slight neck.

Dimensions: (in mm)

	Coil Diam	Uniserial Diam	Height
Figured specimen A	0.15	0.13	0.33
specimen B(j)	0.18	0.13	0.23
Figured specimen C	0.18	0.18	0.40
Figured specimen D	0.15	0.15	0.45
Figured specimen E	0.18	0.14	0.40
specimen F	0.15	0.14	0.40

(j) = juvenile specimen

Remarks: Ammobaculites sp. cf. A. venustus Loeblich and Tappan strongly resembles A. venustus in general morphology and size. It differs however in having a more inflated - rather than compressed - test, fewer chambers in the coiled portion (3 to 4 versus 5 to 6 in the last whorl of the coil), and in possessing a more pyriform ultimate chamber.

The nature of the coiling in the initial portion of A. sp. cf. A. venustus is somewhat unstable with some megalospheric (?) specimens showing a tendency to have more of a (?)streptospiral or (?)trochospiral coiling arrangement. However, the species shows no tendencies to having distinct planispiral and streptospiral heteromorphs, unlike some of the larger forms.

Types:	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57361	051337	51.0
specimen B	57362	051337	51.0
Figured specimen C	57363	"	"
Figured specimen D	57364	"	"
Figured specimen E	57365	"	"
specimen F	57366	051332	43.5

Occurrence: Ammobaculites sp. cf. A. venustus Loeblich and Tappan occurs in large numbers (greater than 50 per sample) from about 44m to 55m above the base of the Lower Member, in strata of late Oxfordian to Kimmeridgian age. It occurs sporadically in several suites higher in the section.

Ammobaculites sp. 5-9

Pl. 17, figs. 1-11

Material: Very common, generally well preserved.

Description: Test free, large, robust; early portion planispirally coiled; coil occupies about 1/5 to 1/6 of total length of test, consists of about 4 to 5 slightly inflated chambers which increase very gradually in size as added; coil diameter usually less than or equal to maximum diameter of uniserial portion; later portion uniserial, straight to gently tapering; consisting of 4 to 6 chambers which are centrally inflated, generally broader than high (height : width ratio generally about 1 : 2 to 1 : 1.5), ultimate chamber rounded to somewhat pyriform; sutures distinct to almost unrecognizable (depending on the grain size of the wall), moderately constricted, obscure in coiled portion, straight and horizontal in uniserial portion; wall very coarsely arenaceous, consists of unsorted quartz grains imbedded in small amount of siliceous matrix, very roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Figured specimen A	0.35	0.58	0.43	2.00
specimen B	0.40	0.56	0.40	1.90
specimen C	0.38	0.55	0.33	1.85
Figured specimen D	0.40	0.43	0.35	1.45
Figured specimen E	0.40	0.40	0.40	1.55
Figured specimen F	0.35	0.50	0.28	1.55

Max Diam = diameter of initial chamber in uniserial portion
Min Diam = diameter of ultimate chamber in uniserial portion

Remarks: Ammobaculites sp. 5-9 is not readily comparable to any other described species with which the author is familiar. Since the coil is so small, it is commonly broken off or obscured due to preservation such that specimens can be mistaken for either rather large Reophax or ?Haplophragmium sp. 5-9. In several specimens it was noted that the coiled portion itself possessed a finely agglutinated wall, whereas the uniserial portion was extremely coarsely arenaceous.

Ammobaculites sp. 5-9 differs from both A. sp. 7-10 and A. alaskensis Tappan (restr.) in being much larger, possessing a relatively smaller, more indistinct coil and being more coarsely arenaceous.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57370	051311	12.0
specimen B	57371	"	"
specimen C	57372	"	"
Figured specimen D	57373	"	"
Figured specimen E	57374	"	"
Figured specimen F	57375	"	"

Occurrence: Ammobaculites sp. 5-9 occurs commonly in the basal 15m of the Lower Member at Martin Creek.

Ammobaculites sp. 5-13

Pl. 16, figs. 1-8, 10, 11; Pl. 18, fig. 11

Material: Common, very well to indifferently preserved.

Description: Test free, large, robust; early portion planispirally coiled, rounded to slightly lobulate in outline, consisting of 4 to 5 chambers which are rounded and moderately inflated and increase very gradually in size as they are added; coil diameter generally 33% to 50% greater than largest diameter of the uniserial portion, coil comprises 25% to 33% of total length of test; later portion straight, rectilinear, uniserial, nearly parallel sided; consisting of 4 to 5 chambers, chambers robust, centrally inflated, rounded in cross-section, broader than high (height : width ratio varies from 1 : 1.5 to 1 : 2), ultimate chamber pyriform, broadest at base; sutures distinct, straight, strongly constricted, horizontal in uniserial portion; wall fairly coarsely arenaceous, composed of roughly equant quartz grains with much siliceous cement giving a somewhat roughened surface; aperture simple, terminal, rounded, produced on a distinct neck.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Figured specimen A	0.31	0.23	0.33	0.85
Figured specimen B	0.26	0.23	0.32	0.85
specimen C	0.26	0.23	0.33	1.03
specimen D	0.25	0.18	0.38	0.91
specimen E	0.20	0.19	0.30	0.55
specimen F	0.28	0.20	0.29	0.75
Figured specimen G(j)	0.28	-	0.38	0.60
Figured specimen H	0.38	0.38	0.58	1.13
Figured specimen I	0.40	-	0.55	0.75+

(j) = juvenile specimen

Remarks: *Ammobaculites* sp. 5-13 closely resembles certain forms included by Tappan (1955, p. 44, Pl. 12, figs. 2, 3, 6, 7) in *A. alaskensis* Tappan, though the Husky specimens are somewhat smaller, possess fewer chambers in the uniserial portion and have a much more pyriform ultimate chamber with a distinct neck.

Ammobaculites sp. 5-13 exhibits an instability within the earlier coiled portion of the test, quite similar to that displayed by other species of Ammobaculites within the Lower Member. There exists a full series of (?)heteromorphs grading from planispirally coiled Ammobaculites sp. 5-13 to streptospirally coiled Haplophragmium sp. 5-13. When these specimens are badly crushed, proper generic assignment is quite difficult.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57376	051315	18.0
Figured specimen B	57377	051315	18.0
specimen C	57378	"	"
specimen D	57379	"	"
specimen E	57380	"	"
specimen F	57381	051314	16.5
Figured specimen G	57382	051314	16.5
Figured specimen H	58501	051315	18.0
Figured specimen I	58502	051315	18.0

Occurrence: Ammobaculites sp. 5-13 occurs in large numbers in suites located 15 to 30 m above the base of the Lower Member at Martin Creek.

Ammobaculites sp. 5-31

Pl. 16, figs. 9, 12-18

?Ammobaculites sp. cf. A. "directa-decora" Scherp SOUAYA, 1976, p. 268, Pl. 10, fig. 11.

Material: Several hundred tests in various states of preservation.

Description: Test free, large, robust; early portion planispirally coiled, consisting of 4 to 5 chambers, chambers somewhat inflated, rounded, increasing gradually in size as added; coil diameter usually equal to or less than maximum diameter of uniserial portion, coil makes up

15% to 20% of entire test; later portion straight, uniserial, margins rounded, nearly parallel, consisting of 4 to 6 chambers; chambers inflated centrally, much broader than high (height to width ratio varies from 1 : 1.5 to 1 : 2), rounded in cross-section, increasing slowly in size as added, ultimate (and commonly penultimate) chambers almost equant, commonly slightly to strongly pyriform; sutures distinct, slightly thickened, somewhat constricted, straight and horizontal in uniserial portion; wall coarsely arenaceous, composed of quartz grains with abundant siliceous cement, roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Figured specimen A	0.40	0.26	0.28	1.05
Figured specimen B	0.53	0.30	0.33	1.68
Figured specimen C	0.36	0.31	0.28	1.03
specimen D	0.33	0.25	0.30	0.93
specimen E	0.43	0.28	0.29	1.15
specimen F	0.48	0.28	0.34	1.08
specimen G	0.40	0.33	0.40	0.93

Max Diam = diameter of initial chamber in uniserial portion.
Min Diam = diameter of ultimate chamber in uniserial portion.

Remarks: Ammobaculites sp. 5-31 closely resembles A. sp. cf. A. "directa-decora" Scherp as figured by Souaya (1976). It differs from A. alaskensis Tappan (restr.) in having a smaller coiled portion, more numerous chambers in the uniserial portion (4 to 6 versus 2 to 4) and in possessing a more pyriform ultimate chamber. It differs from A. imlayi Loeblich and Tappan in being twice as large, having a more inflated coil and being composed of coarser sand particles.

Ammobaculites sp. 5-31 is the planispirally coiled analog (?heteromorph) of Haplophragmium sp. 5-12. In crushed or poorly preserved specimens it may prove impossible to distinguish which genus the form belongs to.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57383	051333	45.0
Figured specimen B	57384	"	"
Figured specimen C	57385	"	"
specimen D	57386	"	"
specimen E	57387	"	"
specimen F	57388	"	"
specimen G	57389	"	"

Occurrence: *Ammobaculites* sp. 5-31 occurs in fair numbers throughout the Lower Member at Martin Creek.

Ammobaculites sp. 5-36

Pl. 16, figs. 19-22

Ammobaculites sp. A SOUAYA, 1976, p.269, Pl. 7, fig. 7, Pl. 12, fig. 10.

Material: Fairly common, generally poorly preserved.

Description: Test free, large, tapering; early portion planispirally coiled with 5 to 6 chambers in coil, chambers not inflated, increasing gradually in size as added, coil diameter generally less than one half that of the maximum diameter of the uniserial portion; later portion straight, rectilinear , uniserial, consisting of 6 to 7 chambers; chambers centrally inflated, much broader than high (height : width ratio is about 3.5 - : 1), increasing fairly rapidly in size as added; sutures indistinct, slightly depressed, straight, horizontal in uniserial portion, nearly radial in coiled portion; wall fairly coarsely arenaceous with much cement, fairly smoothly finished; aperture simple, terminal, rounded, sometimes slightly produced on rim or collar.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Figured specimen A*	1.00	0.68	0.60	1.90
specimen B	0.93	0.68	0.63	1.95
Figured specimen C*	1.08	0.53	-	2.38+
specimen D*	1.10	0.58	-	1.88+
specimen E	0.90	0.58	0.50	1.50
specimen F*	0.98	0.65	0.53	1.95
Figured specimen G*	0.98	-	-	-

Max Diam = diameter of ultimate chamber in uniserial portion.
Min Diam = diameter of initial chamber in uniserial portion.
* = damaged, partial, crushed specimen.

Remarks: Ammobaculites sp. 5-36 is very similar - and probably conspecific with - Ammobaculites sp. A. Souaya (1976), from the late Callovian of the Sverdrup Basin. The Husky forms are somewhat smaller but are otherwise identical to Souaya's species.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57396	051338	52.5
specimen B	57397	"	"
Figured specimen C	57398	"	"
specimen D	57399	"	"
specimen E	57400	"	"
specimen F	57401	051337	51.0
Figured specimen G	57402	"	"

Occurrence: Ammobaculites sp. 5-36 occurs sporadically and in small numbers throughout the Lower Member at Martin Creek.

Ammobaculites sp. 7-7

Pl. 14, figs. 15-18, 21-31

Material: About 250 generally well preserved specimens.

Description: Test free, large, robust; initial portion in form of tight planispiral coil, completely evolute, coil tends to be rounded, lenticular in cross-section, about 50% wider than the uniserial portion, comprises about 30% of total length of test; 6 to 7 chambers in coil, chambers inflated centrally, wedge-shaped, increasing very gradually in size as added; uniserial portion straight, rounded in cross-section, consisting of 3 (and rarely 4) chambers; chambers centrally inflated, broader than high (height : width ratio = c. 1 : 2); ultimate chamber (adults) equant, rounded; sutures distinct, thickened (limbate), moderately depressed, arcuate (crescentic) in coiled portion, straight and horizontal in uniserial portion; wall fairly coarsely arenaceous, consists of equant quartz grains with abundant siliceous cement, fairly roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Figured specimen A	0.30	0.33	0.50	0.89
Figured specimen B	0.33	0.35	0.50	0.73
Figured specimen C(j)	0.30	-	0.46	0.68
Figured specimen D(j)	0.35	-	0.46	0.65
Figured specimen E(j)	0.28	-	0.43	0.46
Figured specimen F(j)	0.25	-	0.38	0.45
Figured specimen G	0.48	0.43	0.73	1.00
Figured specimen H	0.30	0.33	0.50	0.80
Figured specimen I	0.43	0.45	0.55	1.23

Max Diam = diameter of initial chamber in uniserial portion
Min Diam = diameter of ultimate chamber in uniserial portion
(j) = juvenile specimen

Remarks: *Ammobaculites* sp. 7-7 is a direct (apparently short-lived) offshoot of the *Ammobaculites alaskensis* Tappan (restr.) group of forms. It bears many common morphological similarities to the latter. It differs in possessing an unique, lenticular shaped coiled portion, in which the chambers are "umbilically" inflated and separated from each other by very distinctive, arcuate sutures.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57403	051398	167.0
Figured specimen B	57404	051398	167.0
Figured specimen C	57405	051397	165.5
Figured specimen D	57406	051397	165.5
Figured specimen E	57407	051403	174.5
Figured specimen F	57408	051403	174.5
Figured specimen G	57409	"	"
Figured specimen H	57368	"	"
Figured specimen I	57369	051398	167.0

Occurrence: Ammobaculites sp. 7-7 is restricted in occurrence to the upper 6 m of the "Porcupine River Formation" sand occuring between 167m and 175m above the base of the Lower Member at Martin Creek. These beds carry a Buchia fauna of ?mid to late Portlandian age.

Ammobaculites sp. 7-10

Pl. 15, figs. 1-6

Material: Abundant, generally very well preserved due to its ability to withstand crushing.

Description: Test free, large, robust, periphery "rounded"; earlier portion planispirally coiled, consisting of 3 to 5 chambers; chambers not inflated, increasing very slowly in size as added; diameter of coil usually equal or slightly greater than maximum diameter of uniserial portion; later portion straight, rectilinear, uniserial; consisting of 3 to 5 chambers; chambers inflated centrally, generally much broader than high (height : width ratio = c. 1 : 2), ultimate chamber about equant though pyriform in shape, widest at base; sutures indistinct (due to coarseness of wall), moderately depressed, straight and horizontal in uniserial portion, straight and nearly radial in coiled portion; wall extremely coarsely arenaceous, composed of unsorted quartz grains in the fine to medium sand range (0.125 to 0.500mm) imbedded in a small amount of cement, very roughly finished; aperture simple, terminal, rounded, often surrounded by slight 'rim' or 'collar'.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Figured specimen A	0.63	0.46	0.65	1.96
Figured specimen B	0.65	0.45	0.63	2.18
specimen C	0.73	0.50	0.60	1.73
specimen D	0.85	0.68	0.75	1.68
specimen E(j)	0.43	0.43	0.58	0.83
specimen F	0.88	0.50	0.65	1.95
Figured specimen G(j)	0.48	0.38	0.58	1.05

Max Diam = diameter of initial chamber in the uniserial portion.
Min Diam = diameter of ultimate chamber in the uniserial portion.
(j) = juvenile specimen.

Remarks: *Ammobaculites* sp. 7-10 most closely resembles *A. multiformis* Dain from the Oxfordian - Kimmeridgian boundary beds of western Siberia. It differs from the latter in being nearly three times as large (1.5mm - 2mm versus 0.50mm - 0.65mm respectively) and in having more chambers in the uniserial portion. It differs from *A. alaskensis* Tappan (restr.) in being somewhat larger, having a more pronouncedly pyriform ultimate chamber and in possessing a much more coarsely arenaceous wall. It differs from ?*Haplophragmium* sp. 5-9 in possessing a distinctly planispiral initial portion.

The coarseness of the grain size used to construct the wall is difficult to explain unless it belongs directly to the species concerned. Within the same suites as *A.* sp. 7-10 are species of *Cribrostomoides* and *Saccammina* with microgranular walls.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57410	051401	171.5
Figured specimen B	57411	"	"
specimen C	57412	"	"
specimen D	57413	"	"
specimen E	57414	"	"
specimen F	57415	051402	173.0
Figured specimen G	57416	"	"

Occurrence: *Ammobaculites* sp. 7-10 occurs in large numbers in the upper 25m of the Lower Member at Martin Creek, in beds of mid to late Portlandian age.

Ammobaculites sp. 7-24

Pl. 17, figs. 12-18

Material: Common, over 100 well preserved tests.

Description: Test free, large; initial portion planispirally coiled, consisting of 1 to 1.5 closely embracing whorls, about 4 to 6 slightly inflated chambers in outer whorl, diameter of coil generally slightly greater than maximum width of uniserial portion; coil occupies about 25% of the entire test; later portion uniserial, straight, parallel-sided, consisting of 4 to 6 chambers; chambers commonly broader than high (height : width ratio = c. 1 : 2), not inflated, expanding very gradually in size as added, ultimate chamber may be slightly pyriform; sutures distinct, slightly constricted, horizontal in uniserial portion; wall coarsely arenaceous with considerable cement, roughly finished; aperture simple, terminal, rounded.

Dimensions:

	Coil Diam	Uniserial Diam	Height
specimen A	0.30	0.29	0.88
Figured specimen B	0.31	0.25	0.90
specimen C	0.35	0.33	1.00
Figured specimen D	0.40	0.25	1.00
Figured specimen E	0.30	0.20	0.88
specimen F	0.35	0.23	0.83

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
specimen A	57390	051415	208.0
Figured specimen B	57391	051415	208.0
specimen C	57392	"	"
Figured specimen D	57393	"	"
Figured specimen E	57394	"	"
specimen F	57395	"	"

Occurrence: *Ammobaculites* sp. 7-24 occurs in large numbers in the uppermost 20 m of the Lower Member at Martin Creek.

Genus *Haplophragmium* Reuss, 1860

Haplophragmium pokrovkaensis Kosyreva

Pl. 22, figs. 9-19

Haplophragmium pokrovkaensis KOSYREVA in Dain *et*. *al*., 1972, Pl. XVIII, figs. 1-5.

Material: About 100 specimens in various states of preservation.

Description: Test free, small, elongate; initial portion streptospirally coiled, occupies about 25% to 33% of test; consists of 2 to 3 chambers (megalospheric) and 3 to 4 chambers (microspheric); chambers globular, inflated, increasing fairly rapidly in size as added; later portion straight, rectilinear, uniserial, consisting of 2 to 3 chambers which are centrally inflated and rounded in cross-section, about as broad as they are high, ultimate chamber slightly to distinctly pyriform; sutures distinct, moderately constricted, horizontal in uniserial portion; wall finely agglutinated, composed of fine quartz grains with much cement, fairly smoothly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Height
Hypotype A	0.14	0.13	0.16	0.45
Hypotype B	0.14	0.14	0.18	0.34
Hypotype C	0.16	0.13	0.18	0.38
Hypotype D	0.16	0.13	0.15	0.39
Hypotype E	0.18	0.13	0.13	0.48
Hypotype F	0.14	0.11	0.14	0.38

Remarks: The Husky forms of *Haplophragmium pokrovkaensis* Kosyreva differ slightly from the Siberian specimens in having chambers in the uniserial portion which are more equidimensional than squat.

Types:

	GSC Type No.	GSC Field No.	Ht. above Meters
Hypotype A	57417	051321	27.0
Hypotype B	57418	"	"
Hypotype C	57419	"	"
Hypotype D	57420	"	"
Hypotype E	57421	"	"
Hypotype F	57422	"	"

Occurrence: *Haplophragmium pokrovkaensis* Kosyreva is restricted in occurrence to the basal 30m of the Lower Member of the Husky Formation at Martin Creek.

Haplophragmium sp. 5-12

Pl. 18, figs. 12-17

Material: Common, generally well preserved.

Description: Test free, large, robust; early portion tightly streptospirally coiled, consisting of 4 to 7 chambers; diameter of coiled portion slightly less than or equal to maximum diameter of uniserial portion, coil normally constitutes 15% to 20% of entire length of test; later portion straight, rectilinear, uniserial, consisting of 4 to 6 chambers, which are inflated, rounded in cross-section, about twice as broad as high, ultimate chamber globular to slightly pyriform, nearly as broad as high; sutures distinct, slightly thickened, strongly constricted, horizontal in uniserial portion; wall composed of medium-sized quartz grains with considerable cement, fairly smoothly finished; aperture simple, terminal, rounded, sometimes produced on slight neck.

Dimensions: (in mm)

	Uniserial Diam	Coil Diam	Height
Figured specimen A	0.45	0.35	1.68
Figured specimen B	0.46	0.25	1.19
specimen C	0.48	0.30	1.38
specimen D	0.43	0.28	1.63
Figured specimen E	0.38	0.30	1.00
specimen F(j)	0.33	0.25	0.80
specimen G(j)	0.36	0.30	0.70

(j) = juvenile specimen

Remarks: Haplophragmium sp. 5-12 most closely resembles H. pokrovkaensis Kosyreva (1972) in general appearence, but differs from the latter in being much larger (two to four times as large) and having more chambers in the uniserial portion. It differs from Haplophragmium sp. 5-13 in possessing a smaller, more obviously streptospirally coiled portion.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57423	051314	16.5
Figured specimen B	57424	"	"
specimen C	57425	"	"
specimen D	57426	051315	18.0
Figured specimen E	57427	"	"
specimen F	57428	"	"
specimen G	57429	"	"

Occurrence: *Haplophragmium* sp. 5-12 occurs quite commonly, though erratically, in suites located 17 to 39m above the base of the Lower Member at Martin Creek.

Haplophragmium sp. 5-13

Pl. 18, figs. 18-24

Material: Common, generally well preserved.

Description: Test free, large; early portion loosely streptospirally coiled, consisting of 5 to 7 rounded chambers which increase rapidly in size as added; coiled portion makes up 25% to 33% of total test; later portion rectilinear, uniserial, rounded in cross-section, consisting of 3 to 5 (most commonly 4) chambers; chambers inflated, initially (first 2 to 4 chambers) about twice as broad as high, ultimate chamber nearly equant, strongly inflated, pyriform in shape and widest at base; sutures distinct, strongly constricted, slightly thickened; wall finely arenaceous with much siliceous cement, smoothly finished; aperture simple, terminal, rounded, produced on the end of a distinct neck.

Dimensions: (in mm)

	Max Width	Coil Diam	Height
Figured specimen A	0.33	0.25	0.96
specimen B	0.29	0.30	0.75
Figured specimen C	0.25	0.38	0.63
specimen D	0.28	0.36	0.66
specimen E	0.28	0.31	0.75
specimen F	0.23	0.26	0.65
Figured specimen G(j)	0.25	0.35	0.38

(j) = juvenile specimen

Remarks: The genera Haplophragmium Reuss and Ammobaculites Cushman are rather closely related. The essential difference between the two is that while the former possesses a streptospirally coiled initial portion, the latter possesses a planispirally coiled initial portion. At which point one genus reverts to the other is not clearly specified. Within the Lower Member of the Husky Formation there are several pairs of forms that clearly belong to the same species group but exhibit a complete spectrum of generic forms from the former to the latter. One such pair is the series Haplophragmium sp. 5-13 to Ammobaculites sp. 5-13. Those forms with a distinct streptospirally coiled portion are assigned to the genus Haplophragmium.

Haplophragmium sp. 5-13 is similar to H. pokrovkaensis Kosyreva from the Upper Jurassic of western Siberia. It differs in being somewhat larger and possessing more chambers in the uniserial portion.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57430	051315	18.0
specimen B	57431	"	"
Figured specimen C	57432	"	"
specimen D	57433	"	"
specimen E	57434	"	"
specimen F	57435	"	"
Figured specimen G	57436	"	"

Occurrence: *Haplophragmium* sp. *5-13* occurs commonly in suites located 17m to 21m above the base of the Lower Member.

?*Haplophragmium* sp. *5-9*

Pl. 18, figs. 1-10

Material: Common, mostly very well preserved.

Description: Test free, large, robust; early portion clearly to indistinctly streptospirally coiled, consisting of 3 to 5 rather slowly expanding chambers; coil occupies about 15% to 20% of total length of test, coil diameter usually considerably less than maximum diameter of uniserial portion; later portion uniserial, straight, gently tapering to nearly parallel-sided, consisting of 4 to 6 chambers which are centrally inflated and somewhat broader than high (height : width ratio = 1 : 2 to 1 : 1.5), ultimate chamber more equant; sutures distinct to nearly unrecognizable (depending on grain size of the wall), moderately constricted, straight and horizontal in uniserial portion; wall composition variable: medium to very coarsely agglutinated, consisting of unsorted quartz grains in small amount of siliceous matrix, smoothly to very roughly finished; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Coil Diam	Uniserial Diam	Height
Figured specimen A	0.28	0.44	1.65
Figured specimen B	0.28	0.60	1.83
Figured specimen C	0.25	0.50	1.58
specimen D	0.35	0.55	1.68
Figured specimen E	0.26	0.48	1.60
Figured specimen F	0.28	0.58	1.75

Remarks: ?*Haplophragmium* sp. *5-9* is used herein to designate those specimens of *Ammobaculites* sp. *5-9* in which the nature of coiling in the initial portion is difficult to determine, but is not distinctly planispiral. All gradations exist from totally indistinct coiling (Figured specimens A and B) to clearly deviant, streptospirally coiled individuals (Figured specimen E).

As in *Ammobaculites* sp. *5-9*, the selection of grain size throughout the life of any one individual specimen is puzzling. Some forms (Figured specimens A, C) are coarse-grained throughout their lifetimes, while others (Figured specimens B, E, and F) appear to alternately choose fine and coarse grains from chamber to chamber. This may possibly indicate variable (?seasonal) availability of coarser detritus throughout the foraminifer's life.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58491	051311	12.0
Figured specimen B	58492	051311	12.0
Figured specimen C	58493	"	"
specimen D	58494	"	"
Figured specimen E	58495	"	"
Figured specimen F	58496	"	"

Occurrence: ?*Haplophragmium* sp. *5-9* occurs commonly in the basal 15m of the Lower Member at Martin Creek.

Genus *Ammobaculoides* Plummer, 1932

Ammobaculoides sp. *7-13*

Pl. 22, figs. 20-24; Pl. 23, figs. 1-5

Material: Fairly common, generally very well preserved.

Description: Test free, small, compressed; early portion planispirally coiled; later portion biserial, with parallel margins or biserial tending to uniseriality, periphery rounded; coil consisting of 1 to 1.5 whorls, approximately 7 chambers per whorl, expanding rapidly in size as added; followed by one to two pairs of loosely biserial chambers: in some individuals these may be strictly biserial (Figured specimens A, B, and D), while in others they may appear wholly uniserial (Figured specimen D); sutures distinct, slightly depressed, slightly curved backward in the coil, oblique to nearly horizontal in the uncoiled portion; wall finely arenaceous, smoothly finished; aperture rounded, areal in the coiled portion, terminal in the later portion.

Dimensions: (in mm)

	Height	Diam Coil	Diam Later Por.
Figured specimen A	0.34	0.17	0.13
Figured specimen B	0.37	0.19	0.11
specimen C	0.33	0.19	0.11
Figured specimen D	0.31	0.20	0.14
specimen E	0.34	0.19	0.14
specimen F	0.33	0.21	0.12
Figured specimen G	0.27	0.19	0.14

Remarks: The species is tentatively assigned to the genus Ammobaculoides due to the apparent trend towards uniseriality of the "biserial" portion of the test. The nature of the aperture (terminal in adult forms) supports this argument. In configuration, some specimens resemble Spiroplectammina sp. Tappan (1955), but are readily distinguished from the latter by their smaller size and lack of "regularity" in the uncoiled portion of the test.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57437	051404	176.0
Figured specimen B	57438	051404	176.0
specimen C	57439	"	"
Figured specimen D	57440	"	"
specimen E	57441	"	"
specimen F	57442	"	"
Figured specimen G	57443	"	"

Occurrence: Ammobaculoides sp. 7-13 occurs in large numbers in a single suite 176 m above the base of the Lower Member.

Ammobaculoides sp. 7-18

Pl. 13, figs. 44-49

Material: Uncommon, about 30 specimens in adequate state of preservation.

Description: Test free, medium-sized, moderately compressed; early portion (about 33% of test) planispirally coiled, evolute, consisting of about two whorls, with 3 to 5 chambers in the first and 7 to 8 chambers in the second whorl , respectively, chambers not inflated, increasing very gradually in size as added; later portion (about 25% to 33% of test) biserially arranged with 2 to 3 pairs of equant chambers present; last portion becoming uniserial, composed of 2 to 3 chambers; chambers not inflated, equant, increasing very gradually in size as added; sutures distinct, thickened (limbate), not depressed; wall quite coarsely agglutinated with considerable cement, roughly finished, with an occasional larger studding grain present; aperture (adult form) simple, terminal, rounded to slightly ovate.

Dimensions: (in mm)

	Max Diam	Min Diam	Coil Diam	Thickness	Height
Figured specimen A	0.20	0.15	0.25	0.15	0.53
specimen B	0.19	0.14	0.23	0.15	0.46
specimen C	0.20	0.15	0.20	0.15	0.43
Figured specimen D	0.23	0.18	0.28	0.18	0.75
specimen E	0.20	0.19	0.25	0.18	0.84
Figured specimen F	0.23	0.18	0.28	0.16	0.68

Max Diam = maximum diameter, straight portion.
Min Diam = minimum diameter, straight portion.

Remarks: Ammobaculoides sp. 7-18 most closely resembles A. phallus Lalicker but differs from the latter in being twice as large, possessing a parallel-sided later portion and having fewer pairs of chambers in the biserial portion.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57444	051409	191.0
specimen B	57445	"	"
specimen C	57446	"	"
Figured specimen D	57447	051415	208.0
specimen E	57448	"	"
Figured specimen F	57449	"	"

Occurrence: Ammobaculoides sp. 7-18 occurs in small numbers (5 to 10 individuals) in the uppermost beds of the Lower Member, first appearing in suites 191m above base and continuing on to the top of the sampled section.

Family TEXTULARIIDAE Ehrenberg, 1838

Remarks: The Textulariidae seem to occur only rarely in boreal Upper Jurassic faunas and never constitute a major portion of any of the described assemblages. In contrast to this general trend, the Lower Member of the Husky Formation contains a rich (albeit numerically small) fauna including Textularia spp., Spiroplectammina sp., Pseudobolivina spp., and Siphotextularia spp. The forms occur throughout the section but only in small numbers, never composing more than 2% of any given suite and frequently less. Their occurrence is invariably restricted to the 200 mesh size fraction. This factor of itself (barring paleoenvironmental considerations) could, at least partially, explain the scarcity of reports of Textulariidae in described suites from other areas.

Family TEXTULARIIDAE Ehrenberg, 1838

Subfamily SPIROPLECTAMMININAE Cushman, 1927

Genus *Spiroplectammina* Cushman, 1927

Spiroplectammina sp. 5-23

Pl. 23, figs. 6-10

Material: Fairly rare.

Description: Test free, small, elongate, compressed; early portion planispirally coiled, later portion biserial, gently tapering (margins nearly parallel), periphery rounded; about five chambers in coil, followed by 6 to 8 pairs of biserially arranged chambers, latter increase in size rather gradually as added so that the margins of the test appear subparallel; sutures distinct, very slightly to non-depressed, slightly curved backwards in the coil, oblique in the biserial portion, at about 30° to the horizontal; wall finely arenaceous with considerable cement, smoothly finished; aperture (adult form) a semi-circular arch at the inner margin of the ultimate chamber, commonly obscured due to preservation.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.28	0.08	0.06
Figured specimen B	0.25	0.08	0.06
Figured specimen C	0.23	0.08	0.05
specimen D	0.22	0.08	0.05
specimen E	0.23	0.08	0.05
specimen F	0.24	0.09	0.05

Remarks: The genus *Spiroplectammina* occurs only rarely in Jurassic and Cretaceous suites in the Canadian Arctic and no described North American forms are closely similar to *Spiroplectammina* sp. 5-23.

Spiroplectammina sp. 5-23 differs from S. tobolskensis Beljaevskaja et Kommissarenko (in Dain et. al., 1972) in possessing smaller overall dimensions, fewer whorls and chambers in the coiled portion and more numerous, regularly-shaped chambers in the biserial portion. It differs from S. suprajurassica Kosyreva (Dain, op. cit.) in being of smaller size, possessing a smaller coil with fewer chambers and in having more chambers in the biserial portion. It differs from both S. vicinalis Dain (Dain, op. cit.) and S. paravicinalis Dain (Dain, op. cit.) in being much smaller, having fewer whorls and chambers in the coiled portion and possessing a wall composed of much finer sand grains.

The species occurs quite rarely in the Lower Member of the Husky Formation and forms with the planispiral portion broken off are quite difficult to distinguish from Textularia sp. cf. T. areoplecta Tappan which often coexists in the same suites.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57450	051324	33.0
Figured specimen B	57451	051325	34.5
Figured specimen C	57452	051326	36.0
specimen D	57453	"	"
specimen E	57454	"	"
specimen F	57455	"	"

Occurrence: Spiroplectammina sp. 5-23 occurs in small numbers in the basal two-thirds of the Lower Member.

Subfamily TEXTULARIINAE Ehrenberg, 1838

Genus *Textularia* Defrance in de Blainville, 1824

Textularia sp. cf. *T. areoplecta* Tappan

Pl. 23, figs. 11-15, 17, 18

?*Textularia areoplecta* TAPPAN, 1955, p. 47, Pl. 13, figs. 13-16.

Material: Uncommon, about 25 specimens in an adequate state of preservation.

Description: Test free, small, strongly compressed, elongate; biserial throughout, gently tapering to nearly parallel-sided, consisting of tiny proloculus followed by 6 to 8 pairs of chambers; chambers broader than high, not inflated, increasing gradually in size as added; sutures distinct, very slightly depressed, slightly oblique; wall very finely arenaceous with much cement, smoothly finished; aperture an high arch at the base of the last-formed chamber.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.23	0.10	0.06
Figured specimen B	0.25	0.09	0.05
specimen C*	0.25+	0.09	0.05
Figured specimen D	0.20	0.09	0.04
Figured specimen E	0.23	0.10	0.06
Figured specimen F	0.24	0.08	0.04

* = broken specimen

Remarks: Tappan (1955) originally described *Textularia areoplecta* from the Lower Jurassic rocks of the north slope of Alaska. She noted the distinctions between her form and comparable European species and these comparisons are not repeated here.

Textularia sp. cf. *T. areoplecta* Tappan closely resembles *T. areoplecta* sensu stricto, but occurs considerably higher in the section. It differs from T. jurassica (Gümbel) in being slightly smaller and possessing oblique rather than transverse sutures.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57456	051323	30.0
Figured specimen B	57457	"	"
specimen C	57458	"	"
Figured specimen D	57459	051326	36.0
Figured specimen E	57460	"	"
Figured specimen F	57461	"	"

Occurrence: Textularia sp. cf. T. areoplecta Tappan occurs in small numbers throughout the Lower Member at Martin Creek.

Textularia sp. 5-20

Pl. 23, fig. 16

Material: Rare.

Description: Test free, small, elongate, compressed, gently tapering; biserially arranged throughout; consisting of spherical proloculus followed by 4 to 6 pairs of chambers; chambers not inflated, somewhat broader than high, increasing gradually in size as added; sutures distinct, fine, flush, slightly oblique; wall very finely arenaceous with much cement, smoothly finished; aperture a low arch at the base of the ultimate chamber.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.35	0.15	0.10
specimen B*	0.36	0.18	0.06

* Crushed specimen

Remarks: Textularia sp. 5-20 differs from T. sp. cf. T. areoplecta Tappan in possessing a larger, more robust test with fewer chambers in it. Also, while the sutures of the former are flush, those in the latter are generally distinctly, though slightly, depressed.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57462	051322	28.5
specimen B	57463	051322	28.5

Occurrence: Textularia sp. 5-20 occurs sparsely in the basal 30m of the Lower Member.

Subfamily PSEUDOBOLIVININAE Weisner, 1931

Genus Pseudobolivina Weisner, 1931

Pseudobolivina sp. 5-27

Pl. 23, figs. 19-23

Material: Uncommon

Description: Test free, tiny, elongate, narrow, nearly parallel-sided; initially wholly biserial with a later tendency to become uniserial or nearly uniserial; test axis may be twisted up to 45° in this process; consisting of spherical proloculus followed by 6 to 7 chambers of which only 4 to 5 are strictly biserially arranged; chambers generally equant (biserial portion) to somewhat inflated and ovate (later portion), increasing gradually in size as added; sutures distinct, fine, moderately to strongly depressed; wall very finely arenaceous with much cement, smoothly finished; aperture simple, terminal, rounded, produced on a distinct neck.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.24	0.06	0.06
Figured specimen B	0.23	0.06	0.05
Figured specimen C	0.28	0.10	0.075
Figured specimen D	0.25	0.075	0.075
specimen E	0.23	0.075	0.06
specimen F	0.25	0.075	0.075

Remarks: Pseudobolivina sp. 5-27 strongly resembles Bimonilina (= Pseudobolivina) variana Eicher (from the Albian of Wyoming) in the mode of 'coiling' of the test. It differs from the latter in being somewhat smaller and possessing an aperture that is rounded and produced on a distinct neck. Some variability exists within this species within the Lower Member as forms occurring closer to the base are usually somewhat larger and more robust than forms occurring higher up.

Pseudobolivina sp. 5-27 appears to be, at least in part, a transitional form to P. sp. 5-19, where the mode of 'coiling' is a moderately twisted, stretched biserial.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57464	051329	39.0
Figured specimen B	57465	"	"
Figured specimen C	57466	029107	1.5-6.1
Figured specimen D	57467	"	"
specimen E	57468	"	"
specimen F	57469	"	"

Occurrence: Pseudobolivina sp. 5-27 occurs sporadically, in small numbers, in the basal 40m of the Lower Member.

Pseudobolivina(?) sp. *5-19*

Pl. 23, fig. 24

Material: Rare.

Description: Test free, tiny, elongate, narrow, very gently tapering to parallel-sided; axial twisting variable: in majority of specimens, initially biserial, later becoming loosely embracing and nearly uniserial, in other specimens however, the axis of the test is loosely twisted and the chambers are arranged in slightly embracing, alternately biserial and uniserial manner; test consists of spherical proloculus and 6 to 8 chambers; chambers about equant to somewhat ovate, moderately inflated, increasing gradually in size as added; sutures distinct, fine, moderately depressed; wall finely arenaceous with much cement, smoothly finished; aperture simple, terminal, rounded, produced on a distinct neck.

Dimensions: (in mm)

	Length	Width
Figured specimen A	0.25	0.09
specimen B	0.18	0.08
specimen C	0.21	0.10

Remarks: *Pseudobolivina* sp. *5-19* probably represents the 'untwisting' mode of *P*. sp. *5-27* taken one step further in 'degeneration', such that some of the forms become nearly uniserial and there is a complete 'destruction' of orderliness in chamber arrangement .

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57470	051310	10.5
specimen B	57471	051309	9.0
specimen C	57472	051309	9.0

Occurrence: Pseudobolivina sp. 5-19 occurs in small numbers, rather sporadically, throughout the basal 30m of the Lower Member.

Genus Siphotextularia Finlay, 1931

Siphotextularia sp. 5-4

Pl. 23, fig. 25-31

Material: Uncommon.

Description: Test free, small, elongate, slightly to moderately tapering; axis may be twisted 90° to 180° in course of ontogeny; biserial throughout; consisting of spherical proloculus followed by 4 to 5 pairs of chambers; chambers increasing moderately to quite rapidly in size as added; initially not inflated, becoming slightly to moderately inflated in last two pairs of chambers; sutures distinct, fine, slightly depressed, slightly oblique; wall very finely arenaceous with much cement, smoothly finished; aperture simple, terminal, rounded, produced on distinct, short neck.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.29	0.14	0.09
Figured specimen B	0.28	0.15	0.13
Figured specimen C	0.29	0.13	0.10
Figured specimen D	0.26	0.13	0.08
specimen E	0.29	0.13	0.08
specimen F	0.33	0.15	0.10

Remarks: Siphotextularia sp. 5-4 is a rather unusual form in that the axis of the test is loosely twisted up to 180° (most commonly about

90°) during the growth of each specimen. As the form shows no tendency to become uniserial, it is assigned to Siphotextularia rather than Pseudobolivina. This criterion,coupled with the rather elongate nature of the test is sufficient to distinguish it from other species of Siphotextularia found in the Lower Member.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57473	051306	4.5
Figured specimen B	57474	"	"
Figured specimen C	57475	"	"
Figured specimen D	57476	"	"
specimen E	57477	029110	18.5-24.0
specimen F	57478	"	"

Occurrence: Siphotextularia sp. 5-4 exists in small numbers in the basal 30m of the Lower Member.

Siphotextularia sp. 5-5

Pl. 23, figs. 34-37

Material: Uncommon.

Description: Test free, small, elongate, slightly compressed, gently tapering; biserial throughout, consisting of spherical proloculus (megalospheric?) followed by 3 to 4 pairs of chambers; chambers initially low, later somewhat ovate, slightly to non-inflated, increasing gradually in size as added; sutures distinct, fine, very slightly depressed, oblique; wall very finely arenaceous with much cement, smoothly finished; aperture simple, terminal, rounded, produced on short, distinct neck.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.28	0.13	0.08
Figured specimen B	0.26	0.10	0.08
specimen C	0.23	0.11	0.08
specimen D*	0.33	0.13	-
specimen E*	0.30	0.10	-

* Crushed specimen

Remarks: *Siphotextularia* sp. 5-5 resembles an extended version of *Siphotextularia* (s. l.) sp. 5-10, but is neither as broad (for a given height) nor as inflated as the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57479	051307	6.0
Figured specimen B	57480	"	"
specimen C	57481	"	"
specimen D	57482	"	"
specimen E	57483	"	"

Occurrence: *Siphotextularia* sp. 5-5 occurs in small numbers (rather sporadically) in the basal 30m of the Lower Member.

Siphotextularia sp. 7-13

Pl. 23, figs. 32, 33

Material: Very rare.

Description: Test free, tiny, strongly compressed, squat, sharply tapering; biserial throughout; consisting of ovate proloculus followed by 2 to 3 pairs of rapidly enlargening chambers; sutures distinct, fine, slightly depressed, oblique; wall finely arenaceous with much cement, smoothly finished; aperture simple, terminal, rounded, produced on a slight neck.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.19	0.13	0.08
Figured specimen B	0.20	0.13	0.08
specimen C	0.18	0.13	0.08

Remarks: Siphotextularia sp. 7-13 is quite similar in design to Siphotextularia(s.l.) sp. 5-10 but differs from the latter in being slightly smaller, possessing fewer chambers, more oblique sutures, a more compressed test and a distinct neck. It is quite likely that this form could have descended from S.(s.l.) sp. 5-10.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57484	051404	176
Figured specimen B	57485	"	"
specimen C	57486	"	"

Occurrence: Siphotextularia sp. 7-13 occurs in small numbers in a single suite located 176m above the base of the Lower Member.

Siphotextularia (s.l.) sp. 5-10

Pl. 23, figs. 38-41

Material: Uncommon.

Description: Test free, tiny, robust, squat, rather strongly tapering, quadrangular in section with rounded angles; biserially arranged throughout, consisting of 3 to 4 pairs of chambers; chambers low, slightly inflated, increasing fairly rapidly in size as added; sutures distinct, slightly depressed, slightly oblique; wall finely arenaceous with considerable cement, fairly smoothly finished; aperture simple, terminal, rounded, generally produced on a short neck.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.25	0.16	0.10
Figured specimen B	0.25	0.16	0.10
Figured specimen C	0.20	0.14	0.10
specimen D	0.25	0.14	0.09
specimen E(j)	0.25	0.13	0.08

(j) = juvenile specimen

Remarks: The generic assignment of Siphotextularia (s.l.) sp. 5-10 is somewhat uncertain as not all specimens studied possess the distinctive aperture raised on a neck. The form is, however, clearly ancestral to Siphotextularia sp. 7-13, which possesses a well developed neck. In general shape the form is also closely related to S. sp. 5-4 but possesses fewer chambers (hence more squat) and lacks the axial twisting of the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	57487	051312	13.5
Figured specimen B	57488	"	"
Figured specimen C	57489	"	"
specimen D	57490	051313	15.0
specimen E	57491	051314	15.0

Occurrence: Siphotextularia (s.l.) sp. 5-10 occurs in small numbers in the basal 60m of the Lower Member.

Family TROCHAMMINIDAE Schwager, 1877

Subfamily TROCHAMMININAE Schwager, 1877

Genus _Trochammina_ Parker and Jones, 1859

Trochammina _kosyrevae_ Levina

Pl. 13, figs. 36-43

Trochammina _kosyrevae_ LEVINA in Dain _et_. _al_., 1972, p. 83, Pl. XXII, figs. 5-9.

?_Trochammina_ sp. cf. _T_. _gryci_ Tappan SOUAYA, 1976, p. 274, Pl. 4, figs.1a-c.

Material: Fairly common, generally well preserved.

Description: Test free, medium-sized, robust, periphery rounded, slightly lobate; flattened both ventrally and dorsally; spire trochospirally coiled, very low; consisting of 2 to 2.5 whorls; chambers slightly inflated, rounded, increasing fairly rapidly in size as added; 6 to 7 in initial whorl, decreasing to approximately 6 in ultimate whorl; all chambers of the approximately 2.5 whorls visible dorsally, only the chambers of the ultimate whorl visible ventrally; umbilicus deeply impressed; sutures distinct, moderately depressed, dorsally inclined against direction of coiling and slightly curved; ventrally straight and radiate; wall composed of fine quartz grains with much cement, smoothly finished; aperture slit-like, at base of ultimate chamber, opening into the umbilicus, commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Hypotype A	0.34	0.30	0.20
Hypotype B	0.38	0.35	0.24
Hypotype C	0.38	0.30	0.20
Hypotype D	0.29	0.26	0.15
Hypotype E	0.28	0.24	0.15
Hypotype F	0.38	0.33	0.25

Remarks: The Husky specimens of Trochammina kosyrevae Levina resemble their Siberian counterparts in all respects, except that their rareness precludes study of microspheric and megalospheric generations. Dextrally and sinistrally coiled variants exist in about equal numbers.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Hypotype A	57492	029109	12.3-18.5
Hypotype B	57493	051312	13.5
Hypotype C	57494	"	"
Hypotype D	57495	"	"
Hypotype E	57496	"	"
Hypotype F	57497	051311	12.0

Occurrence: Trochammina kosyrevae Levina occurs in small numbers in the basal portion of the Lower Member (?early Oxfordian) from 4.5m to 15m above the base of the Husky Formation.

Trochammina omskensis Kosyreva

Pl. 25, figs. 1-12

Trochammina omskensis KOSYREVA in Dain et. al., 1972, p. 84, Pl. XXIII, figs. 1-7.

Material: Over 50 specimens in excellent state of preservation.

Description: Test free, small, trochoid, plano-convex in cross-section; spire low to very low, peripheral margin lobulate; consisting of 3 to 3.5 whorls; chambers in initial whorl rounded, later becoming trapezoidal in shape, slightly inflated, increasing gradually in size as added; about 7 to 8 in initial whorl, with same number in succeeding whorls; all chambers of the approximately three whorls visible dorsally, only the chambers of the ultimate whorl visible ventrally, umbilical region rather strongly depressed; sutures distinct, fine, slightly depressed, curved backwards against direction of coiling dorsally, straight and radiate ventrally; wall very finely arenaceous with much cement, smoothly finished; aperture a low arch at the base of the ultimate chamber, opening into the umbilicus.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Hypotype A	0.21	0.19	0.11
Hypotype B	0.20	0.18	0.10
Hypotype C	0.16	0.14	0.08
Hypotype D	0.19	0.18	0.08
Hypotype E	0.21	0.19	0.10
Hypotype F	0.20	0.19	0.09

Remarks: The Husky specimens of Trochammina omskensis Kosyreva agree well with microspheric specimens of the species illustrated by Kosyreva from the latest Oxfordian of western Siberia. In the Husky Formation this form occurs in strata that are thought to be slightly older: Lower or Middle Oxfordian.

The form differs from Trochammina sp. 7-13A in being somewhat larger (0.19mm - 0.21mm versus 0.14mm - 0.16mm), less radically plano-convex in cross-section and possessing a considerably smaller height : width ratio. Additionally, the umbilicus is much more deeply impressed in the latter than in the former.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	57498	051310	10.5
Hypotype B	57499	051310	"
Hypotype C	57500	"	"
Hypotype D	57501	"	"
Hypotype E	57502	051308	7.5
Hypotype F	57503	051306	4.5

Occurrence: Trochammina omskensis Kosyreva occurs in fair numbers in the basal 20m of the Lower Member.

Trochammina sp. cf. T. elevata Kosyreva

Pl. 24, figs. 1-18

?Trochammina elevata KOSYREVA in Dain et. al., 1972, p. 88, Pl. XXIII, figs. 8-11, 13.

Trochammina topagorukensis (Tappan) SOUAYA,1976, p. 293, Pl. 6, figs. 2a-c. (non Trochammina topagorukensis TAPPAN, 1955; non Trochammina topagorukensis Tappan subsp. A SOUAYA, 1976).

Material: Abundant, generally well preserved.

Description: Test free, small, trochoid; lobulate in outline; consisting of 3 to 3.5 whorls; chambers globular, expanding very rapidly in size as added, 4 in initial whorl (microspheric), 1 to 3 in initial whorl (megalospheric), with 4 chambers in each whorl thereafter; all chambers of the approximately three whorls visible dorsally, only the four chambers of the ultimate whorl visible ventrally; sutures straight, radiate, slightly depressed; spire moderate to low; wall very finely arenaceous with much cement, smoothly finished; aperture at the base of the final chamber, opening into the umbilicus.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.27	0.21	0.19
Figured specimen B	0.31	0.24	0.21
Figured specimen C	0.26	0.26	0.18
Figured specimen D	0.24	0.20	0.16
specimen E	0.21	0.19	0.14
Figured specimen F	0.23	0.20	0.13
Figured specimen G	0.24	0.23	0.14

Remarks: This form is very similar to (and may well be conspecific with) Trochammina elevata Kosyreva (in Dain, 1972), though the form under consideration appears somewhat larger. Also Kosyreva includes both high- and low-spired variants within her species whereas the Husky forms are uniformly high-spired.

The species differs from Trochammina topagorukensis Tappan (1955) in being entirely 'quadriserial' throughout, whereas Tappan's form increases the number of chambers per whorl in the intermediate whorls and decreases to four only in the ultimate whorl. The form assigned to T. topagorukensis Tappan by Souaya (1976) clearly does not fit Tappan's original diagnosis, but does bear strong resemblence to the present form.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	57504	051325	34.5
Figured specimen B	57505	"	"
Figured specimen C	57506	"	"
Figured specimen D	57507	"	"
specimen E	57508	"	"
Figured specimen F	58001	"	"
Figured specimen G	58002	"	"

Occurrence: Trochammina sp. cf. T. elevata Kosyreva occurs in large numbers (> 50 per sample) in suites located 32m to 39m above the base of the Lower Member at Martin Creek.

Trochammina sp. cf. T. elevata Kosyreva subsp. 1

Pl. 24, figs. 19-27

Material: Common, generally well preserved.

Description: Test free, medium-sized, trochoid, lobulate in outline; consisting of 3 to 4 whorls; chambers globular, expanding fairly rapidly as added, except in the ultimate whorl where they expand several orders of magnitude greater than in any preceding whorl; 4 chambers in initial whorl (microspheric), with four chambers in each whorl thereafter; all chambers of the approximately four whorls visible dorsally, only the four chambers of the ultimate whorl visible ventrally; sutures straight, radiate, moderately depressed; spire moderate to very low; wall finely arenaceous with much cement, smoothly finished; aperture a slit at the base of the ultimate chamber, opening into the umbilicus.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
specimen A	0.39	0.37	0.33
Figured specimen B	0.41	0.36	0.30
Figured specimen C	0.36	0.29	0.26
Figured specimen D	0.39	0.33	0.29
specimen E	0.43	0.36	0.31
specimen F	0.37	0.34	0.23
specimen G	0.47	0.40	0.33

Remarks: Trochammina sp.cf. T. elevata subsp. 1 is similar to T. sp. cf. elevata in all aspects except for the greatly inflated chambers of the ultimate whorl. It differs from both T. topagorukensis Tappan and T. elevata Kosyreva s.s. by its greater size and the above mentioned inflation of the ultimate whorl. Only microspheric individuals have as yet been recognized.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
specimen A	58003	051325	34.5
Figured specimen B	58004	"	"
Figured specimen C	58005	"	"
Figured specimen D	58006	"	"
specimen E	58007	"	"
specimen F	58008	"	"
specimen G	58009	"	"

Occurrence: Trochammina sp. cf. T. elevata Kosyreva subsp. 1 occurs in small numbers in suites located 32m to 39m above the base of the Lower Member.

Trochammina sp. cf. T. rostovezevi Levina

Pl. 13, figs. 24-35

?Trochammina rostovzevi LEVINA in Dain et. al., 1972, p. 82, Pl. XXII, figs. 1-3.

Material: Rare.

Description: Test free, medium-sized, trochoid, with moderate spire; robust, periphery rounded or slightly lobulate; consisting of 2.5 to 3 whorls; chambers inflated, rounded, increasing rapidly in size as added, 6 to 7 in initial whorl decreasing to 5 to 6 in ultimate whorl; all chambers of the approximately 3 whorls visible dorsally, only the chambers of the ultimate whorl visible ventrally; sutures distinct, slightly thickened, slightly depressed, oblique on dorsal side, inclined against the direction of coiling; on ventral side straight and radiate; wall finely arenaceous with much cement, smoothly finished; aperture slit-like, at base of the ultimate chamber, opening into the umbilicus.

Dimensions: (in mm)

	Max. Diam	Min Diam	Height
Figured specimen A	0.40	0.38	0.25
specimen B	0.40	0.38	0.25
Figured specimen C	0.38	0.34	0.30
Figured specimen D	0.39	0.38	0.23
Figured specimen E	0.43	0.35	0.28
specimen F	0.38	0.30	0.21

Remarks: The Husky specimens closely resemble *Trochammina rostovzevi* Levina except that they appear to have, on the average, 1 to 2 more chambers in the ultimate whorl. Levina restricts the occurrence of *T. rostovzevi* to the Callovian of western Siberia, whereas the Husky forms are slightly younger - ?early Oxfordian in age.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58010	051306	4.5
specimen B	58011	051306	4.5
Figured specimen C	58012	"	"
Figured specimen D	58013	051312	13.5
Figured specimen E	58014	029109	12.3-18.5
specimen F	58015	029109	12.3-18.5

Occurrence: *Trochammina* sp. cf. *T. rostovzevi* Levina occurs only rarely in the basal portion of the Lower Member of the Husky Formation, in strata tentatively assigned (at least partially) to the early Oxfordian on the basis of the ammonite *Cardioceras* s.l. sp. indet. It has the same range and vertical distribution as *T. kosyrevae* Levina, though it occurs more rarely.

Trochammina sp. *5-13*

Pl. 25, figs. 13-24

Material: Over 100 specimens in excellent state of preservation.

Description: Test free, small, trochoid, robust; spire low to moderate; periphery lobulate; consists of 3 to 4 whorls; chambers numerous, moderately inflated, increasing rapidly in size as added, 3 to 5 in initial whorl, increasing to 5 or 6 in whorls thereafter, with about 5 in the ultimate whorl; all chambers of the approximately four whorls visible dorsally, only the chambers of the ultimate whorl visible ventrally; umbilicus quite broad and deeply depressed; sutures distinct, fine, moderately depressed; slightly oblique dorsally, straight and radiate ventrally; wall finely arenaceous with considerable siliceous cement, fairly smoothly finished; aperture slit-like, at the base of the ultimate chamber, opening into the umbilicus.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.28	0.25	0.15
specimen B	0.23	0.20	0.15
Figured specimen C	0.28	0.23	0.18
Figured specimen D	0.25	0.23	0.13
specimen E	0.29	0.25	0.18
Figured specimen F	0.23	0.23	0.13
specimen G	0.29	0.24	0.18

Remarks: *Trochammina* sp. *5-13* bears some resemblance - in size and chamber arrangement (i.e. number of chambers per whorl rather than shape) - to *T*. sp. *5-25*, but differs from the latter in being slightly larger and possessing fewer, more greatly inflated chambers in each whorl. It differs from *T*. sp. *7-21* in possessing a lower, more gradually ascending spire, and in lacking the greatly expanded ultimate whorl of the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58016	051315	18.0
specimen B	58017	"	"
Figured specimen C	58018	"	"
Figured specimen D	58019	051312	13.5
specimen E	58020	"	"
Figured specimen F	58021	051309	9.0
specimen G	58022	"	"

Occurrence: Trochammina sp. 5-13 occurs in fair numbers in the basal 30m of the Lower Member.

Trochammina sp. 5-25

Pl. 26, figs. 1-9, 16-18

Material: Abundant, generally well preserved.

Description: Test free, small, trochoid, concavo-convex; rounded in outline; consisting of 3 to 3.5 whorls; chambers numerous, not inflated, expanding gradually in size as added, 7 to 8 in ultimate whorl; all whorls visible dorsally, earlier whorls partially concealed ventrally; spire moderate to low; sutures straight or very slightly depressed; wall finely arenaceous with much cement, smoothly finished; aperture on inner margin of ultimate chamber, opening into the umbilicus; commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.23	0.21	0.15
Figured specimen B	0.23	0.21	0.12
Figured specimen C	0.23	0.19	0.10
specimen D	0.24	0.23	0.12
specimen E	0.24	0.23	0.10
specimen F	0.23	0.21	0.20
Figured specimen G	0.24	0.23	0.14

Remarks: Both sinistral and dextral variants in coiling direction are present in this species. They occur in about equal amounts.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58023	051326	36.0
Figured specimen B	58024	051324	33.0
Figured specimen C	58025	"	"
specimen D	58026	"	"
specimen E	58027	029113	30.3-36.4
specimen F	58028	"	"
Figured specimen G	58029	051328	39.0

Occurrence: Trochammina sp. 5-25 occurs in fair numbers throughout the Oxfordian and Kimmeridgian portion of the Lower Member at Martin Creek.

Trochammina sp. 5-27

Pl. 25, figs. 25-32

Material: Common, generally well preserved.

Description: Test free, small, trochoid, rounded in outline; consisting of 2 to 2.5 whorls; chambers numerous, slightly compressed, expanding gradually in size as added, 7 to 8 in ultimate whorl; all whorls visible dorsally, only ultimate whorl visible ventrally; spire very low; sutures distinct, slightly curved and slightly depressed; wall finely arenaceous with much cement, smoothly finished; aperture on inner margin of ultimate chamber, opening into the umbilicus; commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.30	0.34	0.09
Figured specimen B	0.21	0.19	0.06
specimen C	0.20	0.20	0.07
Figured specimen D	0.21	0.19	0.06
specimen E	0.21	0.20	0.06
specimen F	0.21	0.16	0.06
specimen G	0.19	0.18	0.07

Remarks: Trochammina sp. 5-27 is similar to T. sp. 5-25 in general morphology and size, but differs in having a much lower spire and lacking the characteristic concavo-convex shape of the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58030	051329	39.0
Figured specimen B	58031	"	"
specimen C	58032	"	"
Figured specimen D	58033	"	"
specimen E	58034	051324	33.0
specimen F	58035	"	"
specimen G	58036	"	"

Occurrence: Trochammina sp. 5-27 occurs in fair numbers in the basal 80m of the Lower Member at Martin Creek.

Trochammina sp. 7-13A

Pl. 26, figs. 10-15, 19-21

Trochammina sp. cf. T. exigua Cushman and Applin, SOUAYA, 1976, p. 287, Pl. 3, fig. 6.

Material: Over 100 specimens in good to excellent state of preservation.

Description: Test free, tiny, trochoid (closely resembling Gyrodina in external appearance); spire very low; periphery slightly lobulate; consisting of 3 to 3.5 whorls; chambers angular-conical, expanding rather gradually in size as added, 7 to 8 in initial whorl, decreasing to 7 in each whorl thereafter; all chambers of the approximately 3 whorls visible dorsally, only the chambers of the ultimate whorl visible ventrally; sutures distinct, fine, slightly depressed, slightly curved against direction of coiling dorsally, straight and radiate ventrally; wall very finely arenaceous with much cement, smoothly finished; aperture slit-like, at the base of the ultimate chamber, opening into the umbilicus.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.19	0.16	0.09
Figured specimen B	0.16	0.14	0.09
Figured specimen C	0.16	0.16	0.11
specimen D	0.16	0.14	0.09
specimen E	0.14	0.13	0.08
specimen F	0.16	0.13	0.11
specimen G(j)	0.10	0.10	0.06

(j) = juvenile specimen

Remarks: Trochammina sp. 7-13A resembles the form figured by Souaya (1976) as Trochammina sp. cf. T. exiqua Cushman and Applin. The Husky specimens are, however, considerably smaller and much higher for a given diameter than the one illustrated by Souaya (i.e. they are more Gyrodina-like in appearance). The species does not, however, bear much resemblance to the original Trochammina exiqua as figured by Cushman and Applin (1946). The form does bear some affinities to T. omskensis Kosyreva, but these differences have been discussed elsewhere (see discussion for T. omskensis Kosyreva; p. 192)

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58037	051404	176.0
Figured specimen B	58038	"	"
Figured specimen C	58039	"	"
specimen D	58040	"	"
specimen E	58041	"	"
specimen F	58042	"	"
specimen G	58043	"	"

Occurrence: *Trochammina* sp. 7-13A occurs in fair numbers in suites located 176m to 182m above the base of the Lower Member.

Trochammina sp. 7-13B

Pl. 26, figs. 22-35

Material: Common, generally well preserved.

Description: Test free, small, trochoid, discoidal; low-spired; periphery broadly rounded; consisting of 2.5 to 3 whorls; chambers numerous, not inflated, increasing gradually in size as added, 8 to 10 in initial whorl, decreasing to about 8 in ultimate whorl; sutures distinct, slightly depressed, oblique; wall very finely arenaceous with much cement, smoothly finished; aperture at base of ultimate chamber, opening into the umbilicus.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.29	0.24	0.12
Figured specimen B	0.24	0.20	0.10
Figured specimen C	0.30	0.24	0.10
Figured specimen D	0.23	0.20	0.10
Figured specimen E	0.17	0.16	0.08

Remarks: This species contains both dextrally and sinistrally coiled variants in about equal numbers. In general appearance, it closely resembles Trochammina sp. 5-25 but differs from the latter in having oblique rather than radial sutures, a much lower spire and lacking the distinctive concavo-convex shape.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58044	051404	176.0
Figured specimen B	58045	"	"
Figured specimen C	58046	"	"
Figured specimen D	58047	"	"
Figured specimen E	58048	"	"

Occurrence: Trochammina sp. 7-13B occurs most commonly in the upper 40m of the Lower Member, but ranges down into the mid-portion of the section as well.

Trochammina sp. 7-20

Pl. 26, figs. 36-38; Pl. 27, figs. 1-9

Material: Common, about 100 specimens.

Description: Test free, small, trochoid; lobulate in outline; consisting of 3 to 4 whorls; chambers globular, strongly inflated, increasing rapidly in size as added, 3 to 4 in initial whorl with 4 in each succeeding whorl thereafter, proloculus spherical; all chambers of the approximately four whorls visible dorsally, only the four chambers of the ultimate whorl visible ventrally; sutures straight, slightly depressed, radial; spire high to very high; wall finely arenaceous with much cement, fairly smoothly finished; aperture at the base of the final chamber, slit-like, opening into the umbilicus.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.33	0.29	0.28
specimen B	0.30	0.26	0.23
Figured specimen C*	0.34	0.30	0.29+
Figured specimen D	0.25	0.23	0.25
specimen E*	0.33	0.29	0.23+
Figured specimen F	0.29	0.25	0.24

* = crushed specimen

Remarks: Trochammina sp. 7-20 closely resembles T. sp. cf. T. elevata Kosyreva in general appearance, number of chambers per whorl and size. It differs from the latter in being much higher spired, possessing chambers which are more greatly inflated, and in having less closely appressed whorls. The form is also normally slightly more coarsely agglutinated than the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58049	051411	197
specimen B	58050	"	"
Figured specimen C	58051	"	"
Figured specimen D	58052	051412	200
specimen E	58053	"	"
Figured specimen F	58054	"	"

Occurrence: Trochammina sp. 7-20 occurs in considerable numbers in the uppermost beds of the Lower Member, commencing at 194m above the base and continuing to the top of the sampled section.

Trochammina sp. *7-21*

Pl. 27, figs. 10-21

Material: About 250 specimens, of which about 50 are in good state of preservation.

Description: Test free, small, trochoid, periphery rounded to slightly lobulate; consisting of 3.5 to 4 whorls; chambers initially about equant, later becoming longer than wide, slightly inflated, increasing gradually in size as added; 8 to 9 in initial whorl (microspheric), 6 to 8 in initial whorl (megalospheric), reducing to about 5 or 6 in ultimate whorl; all chambers of the approximately four whorls visible dorsally, only the chambers of the ultimate whorl visible ventrally, umbilicus moderately to non-impressed; sutures fine, distinct, slightly depressed, slightly curved against direction of coiling; spire rather variable; moderately high to low variants common; wall very finely arenaceous with much cement, smoothly finished; aperture at the base of the ultimate chamber, opening into the umbilicus.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.29	0.28	0.16
specimen B	0.33	0.26	0.13
Figured specimen C	0.26	0.25	0.18
Figured specimen D	0.26	0.23	0.13
Figured specimen E*	0.30	0.31	0.20+
specimen F	0.25	0.24	0.13

* = crushed specimen

Remarks: *Trochammina* sp. *7-21* is somewhat unorthodox in design in that both high and low spired variants exist in what is obviously the same species group. Due to the nature of the present study, no attempt has been made to sort these two forms out. *T.* sp. *7-21* differs from *T.* sp. *5-25* in possessing a generally higher spire, a greater number of whorls (4 versus 3 to 3.5) and more chambers in the initial and fewer in the final whorls respectively.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58055	051412	200
specimen B	58056	"	"
Figured specimen C	58057	"	"
Figured specimen D	58058	"	"
Figured specimen E	58059	"	"
specimen F	58060	"	"

Occurrence: *Trochammina* sp. 7-21 shares a common range with *T.* sp. 7-20 and *Ammobaculoides* sp. 7-18. It occurs in the uppermost beds of the Lower Member, commencing at 194m and continuing on to the top of the sampled section.

(?)*Trochammina* sp. 29109

Pl. 25, figs. 33-35

Material: Rare, about 20 specimens in excellent state of preservation.

Description: Test free, medium-sized, robust; trochospirally coiled, high to very high spired; tapering, periphery slightly lobulate; consisting of 4 to 4.5 whorls; chambers globular, strongly inflated, increasing rapidly in size as added; about 4 to 5 in initial whorl (microspheric), 2 to 3 in initial whorl (megalospheric), with 4 chambers in each whorl thereafter; all chambers of the approximately 4 whorls visible dorsally, only the chambers of the ultimate whorl visible ventrally; sutures distinct, moderately depressed; wall finely arenaceous, with much cement, somewhat roughly finished; aperture at base of ultimate chamber, opening into the umbilicus; commonly obscured due to preservation.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.34	0.31	0.33
specimen B	0.34	0.33	0.26
specimen C	0.30	0.30	0.28
specimen D	0.38	0.31	0.30
specimen E	0.36	0.34	0.29

Remarks: The generic assignment of (?)Trochammina sp. 29109 is somewhat problematic because of the extremely high spired coil it possesses. If intermediates grading into more moderately spired variants were not present, the species could easily be mistaken for either Gravellina or Orientalia. Sutherland and Stelck (1972) have noted similar problems with the identification of the late Albian form Trochammina rutherfordi mellariolum Eicher. Here the very high spired variants could have been mistaken for Eggerella had not intermediates been present.

(?)Trochammina sp. 29109 closely resembles T. sp. cf. T. elevata Kosyreva (found in large numbers in the smaller mesh fractions), but possesses a [relatively] much higher spire, a more acutely tapering test and 4 instead of 3 to 3.5 whorls. It differs from T. sp. cf. T. elevata subsp. A in having a much higher spire and lacking the enormously inflated ultimate whorl of the latter. (?)Trochammina sp. 29109 would provide an immediate ancestor for T. sp. cf. T. elevata Kosyreva and its variants.

Trochammina elevata Kosyreva possesses a much lower spire and has fewer whorls that does (?)T. sp. 29109.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58061	29109	12.3-18.5
specimen B	58062	"	"
specimen C	58063	"	"
specimen D	58064	"	"
specimen E	58065	"	"

Occurrence: (?)Trochammina sp. 29109 occurs rarely from about 12m to 15m above the base of the Lower Member, in beds of ?early to mid Oxfordian age.

Genus Ammosphaeroidina Cushman, 1910

?Ammosphaeroidina sp. 5-23

Pl. 28, figs. 1-11

Trochammina(?) ex. gr. canningensis (Tappan) DAIN, 1972, p. , Pl. XIII, fig. 1, non fig. 2.

Material: Abundant, several hundred well preserved tests.

Description: Test free, small, globular in appearance; ?trochospirally coiled; consisting of 1 to 1.5 whorls; megalospheric(?) proloculus followed by 3 to 4 chambers; chambers inflated, globular, expanding rapidly in size as added and closely overlapping, 3 to 4 in ultimate whorl; spire very low; sutures straight, fine, strongly depressed; wall very finely arenaceous with much cement, fairly smoothly finished; aperture obscure.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.25	0.21	0.16
Figured specimen B	0.23	0.19	0.18
Figured specimen C	0.26	0.21	0.19
Figured specimen D	0.23	0.23	0.18
specimen E	0.24	0.23	0.18
specimen F	0.21	0.20	0.15
specimen G	0.18	0.18	0.13

Remarks: ?*Ammosphaeroidina* sp. 5-23 differs from *Trochammina canningensis* Tappan in being somewhat smaller and possessing fewer, more closely overlapping chambers. Dain (1972) seems to have recognized this problem as she assigned specimens identical with the Husky forms to *Trochammina*(?) ex. gr. *canningensis* (Tappan).

The actual generic assignment of ?*Ammosphaeroidina* sp. 5-23 is more difficult to assess. By general definition, the form is a *Trochammina*, though of quite unorthodox design. Three genera, two modern (*Ammosphaeroidina* Cushman and *Cystammina* Neumayr) and one Upper Cretaceous (*Praecystammina* Krasheninnikov) bear close resemblence to the form under consideration.

The genus *Cystammina* Neumayr is defined as being "test free, trochoid, chambers few, high, inflated; sutures distinct, depressed; wall finely agglutinated with considerable cement; aperture comprising slit in base of final chamber, paralleling and near basal margin, on ventral side". The genus has a cosmopolitan distribution and the lectotype illustrated in the Treatise (Loeblich and Tappan, 1964, p. C264, fig. 177, nos. 1a-c) is of a size comparable to the Husky forms.

The genus *Ammosphaeroidina* Cushman is defined as being "globose, streptospirally coiled with few embracing chambers; only 3 of final whorl visible at the exterior; wall agglutinated, aperture a low, interior marginal arch". As with Cystammina, the form has a cosmopolitan distribution.

Clearly, the two genera have much in common, the main distinguishing criteria being that the former possesses trochospiral coiling and a raised, slit-like aperture, while the latter is streptospirally coiled with the aperture in the form of an interior-marginal arch.

The nature of the coiling in the Husky form is difficult to ascertain: it could either be trocho- or streptospiral. Because the forms are so small, the aperture is commonly obscured. However, in Figured specimens A, C and G, there are hints that the aperture may be a low, interior-marginal arch. On this basis - and pending more detailed studies - the form is tentatively assigned to the genus Ammosphaeroidina.

Krasheninnikov (1973) described the genus Praecystammina from the Upper Cretaceous (Santonian - Campanian) strata of the northwest Pacific Ocean. This genus is similar to both of the above mentioned ones, but possesses a raised, ovate, lipped aperture. The Husky species is very similar in general appearance, nature of coiling and size to Praecystammina but differs in having a more coarsely agglutinated, thicker wall and an aperture that is probably interior-marginal.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58066	051324	33.0
Figured specimen B	58067	"	"
Figured specimen C	58068	"	"
Figured specimen D	58069	"	"
specimen E	58070	"	"
specimen F	58071	"	"
specimen G	58072	"	"

Occurrence: ?Ammosphaeroidina sp. 5-23 occurs in large numbers in the basal 65m of the Lower Member at Martin Creek and only sporadically thereafter.

Family ATAXOPHRAGMIIDAE Schwager, 1877

Subfamily VERNEUILININAE Cushman, 1911

Genus Verneuilina d'Orbigny in de la Sagra, 1839

Verneuilina sp. cf. V. anglica Cushman var. 1

Pl. 29, figs. 1-5

?Verneuilina anglica CUSHMAN, 1936, p. 1, Pl. 1, figs. 1a-b.

Verneuilina anglica Cushman, SOUAYA, 1976, p. 293, Pl. 6, fig. 9.

Material: Fairly common.

Description: Test free, small, elongate; pyramidal,triangular in cross-section, angles prominent, sharp, sides moderately to strongly concave; axis of test rarely slightly twisted; test triserial with 6 to 7 tiers of three chambers each; chambers flat-sided, slightly inflated of roughly uniform shape, increasing gradually in size as added; sutures distinct, slightly depressed, oblique; wall finely arenaceous with much cement, somewhat roughly finished; aperture low arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.35	0.18
Figured specimen B	0.34	0.18
specimen C	0.33	0.18
Figured specimen D	0.36	0.18
Figured specimen E	0.33	0.15
Figured specimen F	0.28	0.16

Remarks: The form is identical to that figured by Souaya (1976) as Verneuilina anglica Cushman, from the Kimmeridgian of England. However, V. anglica sensu stricto is a much larger form, being approximately twice as large as either the Husky form or the one illustrated by Souaya. Therefore a direct species assignment is felt to be unjustified at the present time.

V. sp. cf. V. anglica Cushman var. 1 differs from V. sp. cf. V. anglica Cushman var. 2 in being much more slender and elongate, having a smaller apical angle and possessing a larger number of tiers.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58073	051381	137.0
Figured specimen B	58074	"	"
specimen C	58075	"	"
Figured specimen D	58076	051383	143.0
Figured specimen E	58077	"	"
Figured specimen F	58078	"	"

Occurrence: Verneuilina sp. cf. Verneuilina anglica Cushman var. 1 occurs fairly commonly in the upper 120m of the Lower Member at Martin Creek.

Verneuilina sp. cf. V. anglica Cushman var. 2

Pl. 29, figs. 6, 7

?Verneuilina anglica CUSHMAN, 1936, p. 1, Pl. 1, figs. 1a-b.

Material: Fairly common.

Description: Test free, small, squat, pyramidal; triangular in cross-section, angles prominent, sharp, sides strongly concave; test triserial, with 4 to 5 tiers of three chambers each; chambers flat-sided, slightly inflated, increasing rapidly in size as added; sutures distinct, slightly depressed, oblique; wall finely arenaceous with much cement, somewhat roughly finished; aperture a low arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
specimen A	0.25	0.18
specimen B	0.20	0.18
Figured specimen C	0.19	0.14
Figured specimen D	0.25	0.15

Remarks: This form closely resembles *Verneuilina* sp. cf. *V. anglica* Cushman var. 1, except that it is much wider or broader for a given height : width ratio than the latter. It differs from *V. anglica* Cushman sensu stricto in being about 1/3 the size.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
specimen A	58079	051381	137.0
specimen B	58080	051383	143.0
Figured specimen C	58081	"	"
Figured specimen D	58082	"	"

Occurrence: *Verneuilina* sp. cf. *V. anglica* Cushman var. 2 occurs in small numbers throughout the upper third of the Lower Member at Martin Creek.

Verneuilina sp. A

Pl. 29, figs. 8-16

Material: Rare.

Description: Test free, small, elongate, pyramidal; triangular in cross-section, angles prominent but rounded; sides moderately concave, periphery slightly lobate; triserial, with 6 to 8 tiers of 3 chambers each; chambers of uniform shape, slightly inflated, increasing gradually in size as added; sutures distinct, slightly depressed, oblique; wall finely arenaceous with much cement, smoothly finished; aperture an high arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.31	0.14
Figured specimen B	0.30	0.13
Figured specimen C	0.30	0.15
Figured specimen D	0.25	0.10
specimen E	0.28	0.13
Figured specimen F	0.30	0.13

Remarks: The generic assignment of *Verneuilina* sp. *A* is somewhat problematical. *V.* sp. *A* has the general characteristics of *Verneuilina* sensu stricto, except that in cross-section the angles are slightly rounded. It differs from *Verneuilinoides* sensu stricto in having a moderately to strongly concave sides (in cross-sectional view). For this reason, it is tentatively assigned to the former taxon.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58083	051404	176.0
Figured specimen B	58084	"	"
Figured specimen C	58085	"	"
Figured specimen D	58086	"	"
specimen E	58087	"	"
Figured specimen F	58088	"	"

Occurrence: *Verneuilina* sp. *A* occurs in small numbers in suites located 176m to 179m above the base of the Lower Member in beds of ?mid to late Portlandian age.

Genus Verneuilinoides Loeblich and Tappan, 1949

Verneuilinoides sp. cf. V. graciosus Kosyreva var. 1

Pl. 28, figs. 12-16, 28

?Verneuilinoides graciosus KOSYREVA in Dain et. al., 1972, p. 98, Pl. XXX, figs. 2-4.

Material: Common.

Description: Test free, very small, elongate, 'robust', gently tapering, 'stubby' at the apex and expanding slowly towards the ultimate volution; triangular in cross-section with rounded angles; triserial, with 5 to 6 tiers of three chambers each; proloculus very small, chambers sub-globular, increasing fairly rapidly in size as added; sutures distinct, strongly depressed; wall finely arenaceous with much cement, roughly finished; aperture a semi-circular arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.34	0.15
Figured specimen B	0.33	0.14
Figured specimen C	0.38	0.16
Figured specimen D	0.35	0.15
Figured specimen E	0.28	0.13
Figured specimen F	0.30	0.10

Remarks: Many of the tests are poorly preserved, with the initial portions being absent, so that the actual number of volutions may in fact exceed six in adult specimens.

The form resembles Verneuilinoides graciosus Kosyreva but is more gently tapering than the latter. Verneuilinoides tryphera Loeblich and Tappan - from the Oxfordian of South Dakota - differs from the Husky form in being much smaller and possessing a more highly tapering test.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58089	051309	9.0
Figured specimen B	58090	051309	9.0
Figured specimen C	58091	"	"
Figured specimen D	58092	"	"
Figured specimen E	58093	"	"
Figured specimen F		"	"

Occurrence: Verneuilinoides sp. cf. V. graciosus Kosyreva var. 1 occurs commonly in the basal 55m of the Lower Member at Martin Creek, in beds of late Oxfordian to Kimmeridgian age.

Verneuilinoides sp. cf. V. graciosus Kosyreva var. 2

Pl. 28, figs. 17-19

?Verneuilinoides graciosus KOSYREVA in Dain et. al., 1972, p. 98, Pl. XXX, figs. 2-4.

Material: Fairly common.

Description: Test free, very small, 'stubby', tapering; rounded at the beginning and flaring very rapidly towards the ultimate whorl; triangular in cross-section, with rounded corners; triserial, with 3 to 4 tiers of three chambers each; chambers sub-globular, expanding rapidly as added; sutures distinct, very slightly depressed; wall finely arenaceous with much cement, smoothly finished; aperture a low arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.20	0.13
Figured specimen B	0.18	0.13
Figured specimen C	0.23	0.13

Remarks: This form differs from other varieties of Verneuilinoides sp. cf. V. graciosus Kosyreva within the Lower Member of the Husky Formation by virtue of its smaller size, fewer number of tiers and much larger apical angle. It may well represent a juvenile of V. sp. cf. V. graciosus var. 1.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58094	051321	27.0
Figured specimen B	58095	"	"
Figured specimen C	58096	"	"

Occurrence: Verneuilinoides sp. cf. V. graciosus Kosyreva var. 2 occurs in small numbers, rather sporadically, throughout the basal 55m of the Lower Member at Martin Creek.

Verneuilinoides sp. cf. V. graciosus Kosyreva var. 3 forma A

Pl. 28, figs. 20-27

?Verneuilinoides graciosus KOSYREVA in Dain et. al., 1972, p. 98, Pl. XXX, figs. 2-4.

Material: Fairly common.

Description: Test free, small, elongate, strongly tapering (pointed at the base and expanding rapidly to the ultimate volution); test triangular in cross-section with rounded corners, periphery slightly lobate; triserial, with 5 to 6 (and rarely 7) tiers of three chambers each; chambers sub-globular, increasing rapidly in size as added and attaining largest dimensions in the ultimate coil; sutures distinct, strongly depressed; wall finely arenaceous with much cement, smoothly finished; aperture a low, semi-circular arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.23	0.15
Figured specimen B	0.28	0.14
Figured specimen C	0.26	0.15
Figured specimen D	0.28	0.13
Figured specimen E	0.33	0.16
specimen F	0.29	0.16

Remarks: This variety most closely resembles Kosyreva's definition of *Verneuilinoides graciosus* Kosyreva, although the test appears to expand in the former than in the latter. It differs from *V. tryphera* Loeblich and Tappan in being somewhat larger and more robust; from both var. 1 and var. 2 in the amount (degree) of taper and in possessing more, greatly inflated and rapidly expanding chambers.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58097	051326	36.0
Figured specimen B	58098	"	"
Figured specimen C	58099	"	"
Figured specimen D	58100	"	"
Figured specimen E	58101	051328	39.0
specimen F	58102	"	"

Occurrence: *Verneuilinoides* sp. cf. *V. graciosus* Kosyreva var. 3 forma A occurs fairly commonly in the basal 55m of the Lower Member of the Husky Formation.

Verneuilinoides sp. cf. V. graciosus Kosyreva var. 3 forma B

Pl. 28, figs. 29, 30

?Verneuilinoides graciosus KOSYREVA in Dain et. al., 1972, p. 98, Pl. XXX, figs. 2-4.

Material: Rare.

Description: Test free, small, elongate, strongly tapering; triangular in cross-section with rounded corners for the initial 4 to 5 tiers, thereafter almost rounded in cross-section; triserial, with 6 to 7 tiers of three chambers each; chambers subglobular, increasing gradually in size as added in initial 4 to 5 tiers, thereafter increasing rapidly in size in the 2 to 3 ultimate tiers; producing, in effect, a thin, then inflated test (in outline); sutures distinct, slightly depressed; wall finely arenaceous with much cement, smoothly finished; aperture a low arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.30	0.15
Figured specimen B	0.25	0.15
specimen C	0.29	0.11
specimen D	0.35	0.15

Remarks: Verneuilinoides sp. cf. V. graciosus Kosyreva var. 3 forma B is very similar to forma A except for the exceptionally inflated penultimate and ultimate whorls. It is considered to be an aberrant (though distinctive) type within the forma A spectrum.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58103	051326	36.0
Figured specimen B	58104	051328	39.0
specimen C	58105	"	"
specimen D	58106	"	"

Occurrence: Verneuilinoides sp. cf. V. graciosus Kosyreva var. 3 forma B occurs rarely in the basal 55m of the Lower Member.

Verneuilinoides sp. cf. V. postgraciosus Kommisarenko

Pl. 28, figs. 31-34

?Verneuilinoides postgraciosus KOMMISARENKO in Dain et. al., 1972, p. 99, Pl. XXX, fig. 5.

Material: Fairly common.

Description: Test free, small, elongate, tapering; pointed at the beginning and gradually expanding towards the aperture; triangular in cross-section with rounded corners; triserial, with 5 to 8 tiers of three chambers each; chambers rounded, moderately inflated, expanding gradually as added; sutures distinct, slightly depressed; wall finely arenaceous with much cement, smoothly finished; aperture a semi-circular arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.38	0.12
Figured specimen B	0.39	0.13
Figured specimen C	0.33	0.11
Figured specimen D	0.28	0.11
specimen E	0.31	0.13

Remarks: Verneuilinoides postgraciosus Kommisarenko was first described from Upper Kimmeridgian to Volgian strata of western Siberia. This species is very similar in general form to Verneuilinoides graciosus Kosyreva described from basal Kimmeridgian strata of the same general area. Within the Lower Member of the Husky Formation forms referable to both these species occur together within the same suites. These strata are dated as being of a generally late Oxfordian to Kimmeridgian age on the basis of Buchia faunas. Kommisarenko's comments notwithstanding, there appears to be no sharp distinction between V. graciosus and V. postgraciosus - rather they seem to be variants [albeit useful variants] within the same group.

Verneuilinoides sp. cf. V. postgraciosus varies from V. sp. cf. V. graciosus var. 1, var. 2, and var. 3 forma A and B in being more slender, having a smaller apical angle, possessing a greater number of coils [5 to 8 vs. 5 to 6] and possessing chambers which are less inflated and expand more gradually. V. tryphera Loeblich and Tappan is much smaller, has fewer tiers and possesses more greatly inflated, sub-globular chambers.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58107	051327	37.5
Figured specimen B	58108	051327	37.5
Figured specimen C	58109	"	"
Figured specimen D	58110	"	"
specimen E	58111	"	"

Occurrence: Verneuilinoides sp. cf. V. postgraciosus Kommisarenko occurs rarely in the basal 25m of the Lower Member at Martin Creek.

Verneuilinoides sp. A

Pl. 28, figs. 35-42

Material: Fairly common.

Description: Test free, small, elongate, tapering, slender; triangular in cross-section with rounded corners; axis of test may be twisted either dextrally or sinistrally up to 180°; triserial, with 7 to 9 tiers of three chambers each; chambers initially sub-globular, increasing gradually in size; becoming somewhat pyriform in the last two or three tiers; sutures distinct, slightly depressed; wall finely arenaceous with much cement; smoothly finished; aperture an high arch at the inner margin of the ultimate chamber.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.40	0.14
Figured specimen B	0.31	0.10
Figured specimen C	0.35	0.13
specimen D	0.33	0.13
Figured specimen E	0.28	0.13

Remarks: Verneuilinoides sp. A bears some resemblance to V. borealis Tappan from the Albian of Alaska, but differs in being somewhat shorter and more slender. It differs from the V. graciosus-postgraciosus species group in being larger and having a noticeably twisted test.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58112	051404	176.0
Figured specimen B	58113	"	"
Figured specimen C	58114	"	"
specimen D	58115	"	"
Figured specimen E	58116	"	"

Occurrence: Verneuilinoides sp. A occurs rarely in the upper 20m of the Lower Member at Martin Creek.

Subfamily GLOBOTEXTULARIINAE Cushman, 1927

Genus Eggerella Cushman, 1933

Remarks: Cushman (1933) proposed the genus Eggerella to cover those trochospirally coiled forms which initially had five chambers per whorl and reduced this number to three by the ultimate whorl. According to the original definition and that followed by Loeblich and Tappan (1964, p. C275) no mention was made of chamber shape nor size of particles used in the wall.

Levina (in Dain, 1972, pp. 102-104) proposed the new genus Eomarssonella to encompass Marssonella-like (= Dorothia Plummer according to Loeblich and Tappan, 1964) forms whose ultimate whorls were triserially rather than biserially arranged. Loeblich and Tappan (1964), following the work of Trujillo (1960), placed Marssonella Cushman 1933 in synonomy with Dorothia Plummer 1931, arguing that there was nothing in the actual wording of the original definitions to distinguish the two genera. Dain et. al. (1972) rejected this decision and reinstated Marssonella as a valid genus. Hence when Levina described a form she believed was ancestral to the latter, an obvious choice for a name was Eomarssonella. Since the initial portion of the test in Eomarssonella is trochospirally coiled (about five chambers per whorl) and the later portion is reduced to a triserial arrangement, the new genus is, by definition, synonymous with Eggerella. Levina disputes this claim by arguing (Levina, op. cit. p. 102) that

> "From the genus Eggerella ... the latter differs in the flat aperture face, and also in the nature of the wall, agglutinated not from quartz crystals, but from fine, silt-like quartz grains."

With respect to the first point, Cushman (1933), in his definition of Eggerella made no reference to the "shape of the apertural face" as being a diagnostic generic criterion. Similarly, no reference was made to the specific grain size used in the make up of the agglutinated wall, other than to mention "finely arenaceous". Essentially there is little (if any) difference between a wall composed of quartz crystals and "silt-like quartz grains". From the above evidence it appears that the genus Eomarssonella was isolated on what would normally be considered specific rather than generic characteristics. The use of grain size as a distinguishing generic feature is highly questionable.

Since Eomarssonella paraconica Levina is a very distinctive form, it is herein proposed that rather than include Eomarssonella directly in synonomy with Eggerella, the name be retained as a subgenus of the latter.

Genus Eggerella Cushman, 1933

Type species: Verneuilina bradyi Cushman, 1933.

Diagnosis: Test a trochoid spire, in the early stages of the microspheric form with five chambers in a whorl, later reducing to four, and in the adult three; wall finely agglutinated on pseudo-chitinous base, may be of calcareous particles in calcareous cement; aperture a low, interior-marginal slit.

Remarks: Although the type species of Eggerella, Verneuilina bradyi Cushman possesses rounded, moderately inflated cahmbers, the actual chamber shape is not considered to be of significance in the definition of the genus. The range of Eggerella was given as Tertiary to Recent by Loeblich and Tappan (1964).

Subgenus Eomarssonella

Type species: Eomarssonella paraconica Levina, 1972.

Description: Test form as in Eggerella sensu stricto, but with non-inflated chambers; apertural face flat or slightly depressed; wall finely arenaceous with much siliceous cement, fairly smoothly finished; aperture a low, interior-marginal slit at the base of the terminal chamber.

Range: Upper Jurassic, Siberia, Arctic North America.

Remarks: The exact relationships between the genera Eggerella (Eomarssonella) and Orientalia Bykova are not clear, but the coexistence of of the two forms in the Lower Member of the Husky Formation, coupled with information on the former from western Siberia provides some clues.

By definition, the genera Eggerella (Eomarssonella) and Orientalia are very closely related. Both possess a trochospirally coiled test, whose initial portion consists of about five chambers per whorl. Thereafter the number of chambers per whorl is reduced, such that in the ultimate whorl (of the adult specimen) the former is triserial, while the latter is quadriserial. This, in essence, is the only difference between the two genera.

Levina (in Dain et. al., 1972, pp. 101-104), in her description of Eomarssonella paraconica (from the Lower Oxfordian of western Siberia), noted that rare adult specimens possessed four chambers in the ultimate whorl. Technically this would place these forms in the genus Orientalia, though no mention was made of this fact. This situation is further complicated by Levina's illustration of an "Eomarssonella" with a supposed quadriserial ultimate whorl (Levina, op. cit., Pl. XXXII, fig. 2). The specimen illustrated clearly has only 2 to 2.5 chambers in the ultimate and not the four which Levina claims in the text. Levina argues (op. cit. p. 104) that these four-chambered forms represent megalospheric heteromorphs of Eggerella (Eomarssonella). However, this explanation runs against current thinking on the nature of microspheric/megalospheric generations, as one expects the megalospheric forms to have fewer chambers than the microspheric ones, while Levina states that the opposite is true. Additionally, within the populations of Eggerella (Eomarssonella) and Orientalia from the Lower Member of the Husky Formation, presumed microspheric/megalospheric heteromorphs can be recognized for each genus.

In western Siberia, Eggerella (Eomarssonella) paraconica Levina ranges throughout the Lower and into the early Upper Oxfordian. As aforementioned, rare specimens of Orientalia are known to coexist with the latter. In the Late Kimmeridgian beds of the Mackenzie Delta area (Northwest Territories, Canada) E. (E.) paraconica Levina again occurs together with representatives of the genus Orientalia (Orientalia sp. 6-17 and its variants), only this time the relative proportions of the two genera are reversed: Orientalia outnumbers Eggerella (Eomarssonella).

This proportional relationship between the two genera in progressively younger sediments may indicate that the genus Orientalia evolved from the genus Eggerella (Eomarssonella) by the addition (?retention) of an extra chamber in the final whorls of the test. Limited evidence from Mid Portlandian strata in the Mackenzie Delta area tends to support this interpretation. In these beds new (albeit closely related) species of both genera occur together in the same suite. Again Orientalia outnumbers Eggerella (Eomarssonella) - this time approximately 2 : 1. Figure 15 shows the vertical ranges of both genera (and their respective species) in western Siberia and Arctic Canada, and the inferred relationships between them.

The above conclusion (based on evidence from western Siberia and northern Canada) concerning the phylogenetic releationships between Eggerella (Eomarssonella) and Orientalia must be treated with some caution. By definition alone the two genera are so closely interrelated that what we may actually be charting is some form of heteromorphy (other than the well understood microspheric/megalospheric heteromorphy) within the same species group. British workers have long recognized this problem when dealing with Jurassic Nodosariidae. In a study of variation in English Bathonian Nodosariidae, Ciffelli (1960) noted that within a given large population of a certain species, morphologic variants existed (in continuous, traceable series) to satisfy the definition of more than one genus. Variation in the coiling of Lenticulina muensteri (Roemer) is a good example of this problem. Ciffelli (op. cit., pp. 556-569) illustrated forms of this species that would - morphologically - be readily assignable to the genus Marginulinopsis.

The same sort of predicament is known to exist within other arenaceous taxa in the present study, with the Ammobaculites - Haplophragmium series being a case in point. Until more detailed studies of this phenomenon are carried out, the author must (at least partially) concur with Ciffelli's (op. cit., p. 568) observation that:

> "... key characters used to define genera should be treated cautiously and evaluated in the light of other test features."

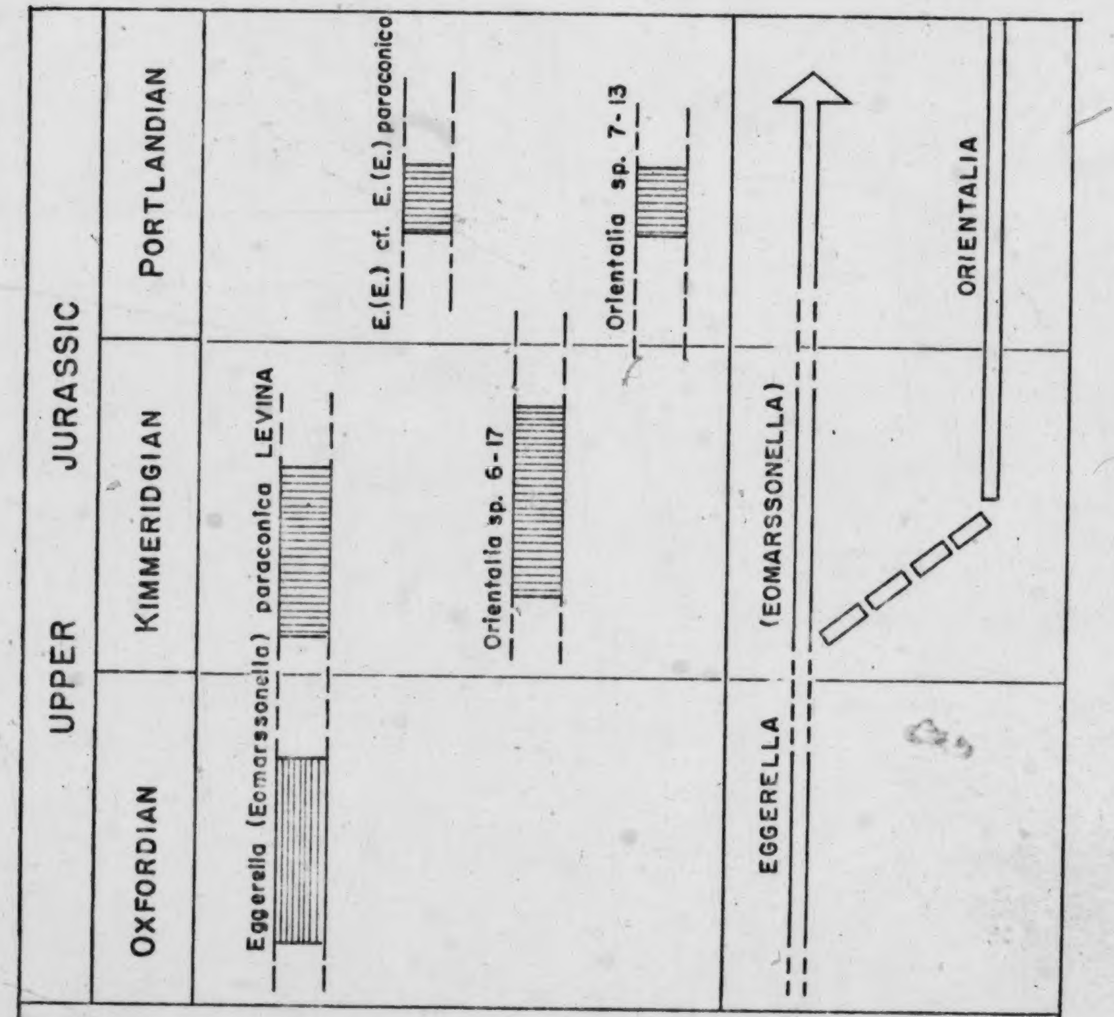


FIGURE 15 INFERRED RELATIONSHIPS BETWEEN EGGERELLA (EOMARSSONELLA) Levina AND ORIENTALIA Bykova

▤ CANADIAN ARCTIC OCCURENCES

▥ WEST SIBERIAN OCCURENCES

Eggerella (*Eomarssonella*) *paraconica* Levina

Pl. 30, figs. 18-22

Eomarssonella paraconica LEVINA in Dain *et*. *al*., 1972, p. 102, Pl. XXXII, figs. 1-11.

Material: Fairly abundant, generally well preserved.

Description: Test free, small, trochospirally coiled, conical in shape, rather stout, gently tapering to a blunt (stubby) apex; rounded in cross-section; consisting of 5 to 6 whorls which increase rather uniformly with growth; initial whorls consisting of about five chambers, subsequently decreasing to four and finally to three in the ultimate whorl (adult); chambers externally rhomboid to oval in shape, increasing gradually in size as added; sutures distinct, straight, slightly depressed, slanted against direction of coiling; wall very finely arenaceous with much cement, smoothly finished; aperture an arched, interior-marginal slit at the base of the terminal chamber, commonly obscured.

Dimensions: (in mm)

	Height	Max Width
Hypotype A	0.34	0.20
Hypotype B	0.31	0.23
Hypotype C	0.33	0.20

Remarks: Not all adult specimens of *Eggerella* (*Eomarssonella*) *paraconica* Levina recovered from the Husky Formation possess the flaring ultimate chambers described by Levina. This is possibly explained by having the latter forms ascribed to the ?microspheric generation, while the others would belong to the megalospheric generation.

E. (*E*.) *paraconica* occurs in small numbers along with *Orientalia* sp. *6-17*. It differs from the latter in having only three chambers in the ultimate whorl of the adult form, whereas *Orientalia* sp. *6-17* has four. As mentioned previously, the forms are closely related, with *E*. (*E*.)

paraconica possibly being ancestral to O. sp. 6-17. The possibility that the forms may, in fact, be heteromorphs of the same species cannot be dismissed.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	58117	051383	143.0
Hypotype B	58118	051383	143.0
Hypotype C	58119	051383	143.0

Occurrence: The form shares a common range with Orientalia sp. 6-17, but occurs in considerably smaller numbers.

Eggerella (Eomarssonella) sp. cf. E. (E.) paraconica Levina

Pl. 29, figs. 26-31

?Eomarssonella paraconica LEVINA in Dain et. al., 1972, p. 102, Pl. XXXII, figs. 1-11.

Verneuilinoides sp. cf. V. georgiae (Terquem) SOUAYA, 1976, p. 293, Pl. 6, figs. 10a-b.

Material: About 50 specimens, half of which are in an adequate state of preservation.

Description: Test free, small, elongate, expanding slowly from sharply pointed apex, rounded in section, except for ultimate whorl which may be slightly lobulate; trochospirally coiled, consisting of 4 to 7 whorls (commonly 4 to 6); initial portion (1 to 3 whorls) with 5 to 6 chambers per whorl decreasing in later portions to quadriserial, and finally, in adult specimens to triserial; chambers rhomboidal in shape (ventrally), increasing very gradually in size as added, in ultimate whorl may become moderately inflated to nearly subglobular; sutures distinct, slightly depressed, straight; wall finely arenaceous with much cement, fairly smoothly finished; aperture an arched interior-marginal slit at the base of the terminal chamber, commonly obscured.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.30	0.20
Figured specimen B	0.20	0.20
Figured specimen C	0.23	0.19
specimen D	0.20	0.18
specimen E	0.27	0.18

Remarks: Eggerella (Eomarssonella) sp. cf. E. (E.) paraconica Levina differs from the latter in having a more slender, sharply pointed test. Although some specimens (Figured specimen C) appear fairly squat due to the greatly inflated ultimate whorl, their initial portions still bear the distinctive, sharp, apex.

The form figured by Souaya (1976) as Verneuilinoides sp. cf. V. georgiae (Terquem) is probably synonymous with the present form, as the initial portions are clearly multiserial (more than four chambers per whorl in the drawing) rather than triserial. The general shape, as well as the greatly inflated ultimate whorl argue favouarbly for its inclusion in this taxon.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58120	051404	176
Figured specimen B	58121	"	"
Figured specimen C	58122	"	"
specimen D	58123	"	"
specimen E	58124	"	"

Occurrence: Eggerella (Eomarssonella) sp. cf. E. (E.) paraconica Levina occurs in a single suite in the upper portion of the Lower

Member. It occurs in abundance 176m above base in silty shales of ?mid Portlandian age, along with Orientalia sp. 7-13.

Genus Orientalia N. K. Bykova, 1947

Orientalia sp. 6-17

Pl. 30, figs. 7-13

?Eomarssonella paraconica LEVINA in Dain et. al., 1972, p. 102, Pl. XXXII, fig. 2, non figs. 1, 3-11.

Material: Several hundred excellently to indifferently preserved specimens.

Description: Test free, medium-sized, trochospirally coiled, rather conical in shape with blunt apex; rounded in cross-section; consisting of 5 to 6 whorls which increase uniformly with growth; initial 2 to 3 whorls consisting of five chambers, decreasing to four chambers in subsequent whorls; chambers externally rhomboidal in shape, slightly inflated, increasing gradually in size as added; sutures distinct, slightly depressed, straight and slanted against direction of coiling; wall very finely arenaceous with much cement, smoothly finished; aperture an arched, interior-marginal slit at the base of the ultimate chamber, normally obscured due to preservation.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.31	0.19
Figured specimen B	0.35	0.23
Figured specimen C	0.30	0.23
Figured specimen D	0.30	0.23
specimen E	0.26	0.20
specimen F	0.28	0.20

Remarks: *Orientalia* sp. *6-17* is very similar to *Eggerella* (*Eomarssonella*) *paraconica* Levina, originally described from the Oxfordian of western Siberia. It differs in having four chambers in the ultimate whorl, whereas the latter has 2.5 to 3. *O*. sp. *6-17* differs from *O*. sp. *7-13* in possessing a stouter, more gently tapering test, and having a more bluntly rounded rather than sharply pointed apex.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58125	051383	143.0
Figured specimen B	58126	"	"
Figured specimen C	58127	"	"
Figured specimen D	58128	"	"
specimen E	58129	"	"
specimen F	58130	"	"

Occurrence: *Orientalia* sp. *6-17* and its variants make a sudden "en masse" appearence in ?Late Kimmeridgian strata 125 m above the base of the Lower Member, and occur in considerable numbers until about 145 m above base, when they abruptly disappear.

Orientalia sp. *6-17* subsp. *1*

Pl. 30, figs. 1-6

Material: About 40 tests in fair to excellent state of preservation.

Description: Test free, medium-sized, robust, rather strongly flaring; trochospirally coiled, rounded in cross-section, except in the ultimate whorl where the periphery may become lobulate; consisting of 5 to 6 whorls, about 5 chambers in the initial whorl; whorls decreasing to about four (rarely 3 to 3.5) in the ultimate whorl; chambers initially rhomboidal in outline (ventral side), slightly inflated, increasing gradually in size as added; in ultimate (and rarely in penultimate) whorl, chambers become globular and strongly inflated and may crowd or distort the ultimate whorl; sutures distinct, slightly to moderately depressed; wall finely arenaceous, consisting of equigranular quartz grains with occasional studding grains, with much cement, fairly smoothly finished; aperture an arched interior-marginal slit at the base of the ultimate chamber, normally obscured due to preservation.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.43	0.35
Figured specimen B	0.39	0.35
Figured specimen C	0.35	0.36
Figured specimen D	0.40	0.31
specimen E	0.44	0.35
specimen F	0.40	0.35
specimen G	0.43	0.34

Remarks: Orientalia sp. 6-17 subsp. 1 varies from more typical O. sp. 6-17 in having an ultimate whorl with greatly inflated, rather than globular chambers. Some forms in this group (i.e. Figured specimens D and G) are clearly transitional to specimens of Eggerella (Eomarssonella) paraconica Levina from the Lower Oxfordian of western Siberia. In these cases it is difficult to make a clean-cut generic assignment and the forms are tentatively assigned to Orientalia.

The species is similar in size and generic design to forms figured by Souaya (1976) as Arenobulimina paynei Tappan. It differs from the latter in having less inflated, more tightly coiled chambers in the initial portion of the test.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58131	051379	131.0
Figured specimen B	58132	"	"
Figured specimen C	58133	"	"
Figured specimen D	58134	"	"
specimen E	58135	051377	125.0
specimen F	58136	051383	143.0
specimen G	58137	051383	143.0

Occurrence: Orientalia sp. 6-17 subsp. 1 is restricted in occurrence to beds of ?late Kimmeridgian age in the Lower Member. It occurs in small numbers from 125m to 145m above the base of the section at Martin Creek.

Orientalia sp. 6-17 subsp. 2

Pl. 30, figs. 14-17

Material: Fairly common, generally well preserved.

Description: Test free, small, robust, rather strongly flaring, squat; trochospirally coiled, rounded in cross-section; consisting of 3 to 4 whorls, 5 to 6 chmabers in initial whorl, decreasing to about 4 in the ultimate whorl; general design of test similar to Arenobulimina; chambers equant, rounded, moderately inflated, increasing slowly in size as added; sutures distinct, slightly depressed, straight; wall finely arenaceous with much cement, somewhat roughly finished; aperture an arched interior-marginal slit at the base of the ultimate chamber, commonly obscured.

Dimensions: (in mm)

	Height	Max Width
specimen A	0.20	0.20
Figured specimen B	0.23	0.21
Figured specimen C	0.25	0.21
specimen D	0.23	0.18
specimen E	0.18	0.19
specimen F	0.15	0.16
specimen G	0.18	0.15

Remarks: The species is assigned to the genus Orientalia (even though it is squat and flaring rather than elongate and tapering) because the initial whorls have 5 to 6 chambers per whorl, decreasing with growth to four chambers per whorl. The test design itself (i.e. mode of coiling) more closely approximates Arenobulimina than Orientalia.

Orientalia sp. 6-17 subsp. 2 differs from O. sp. 6-17 in being smaller, with fewer whorls in the adult form and possessing a much more flaring (squat and equidimensionsal) test.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
specimen A	58138	051383	143.0
Figured specimen B	58139	"	"
Figured specimen C	58140	"	"
specimen D	58141	051377	125.0
specimen E	58142	"	"
specimen F	58143	"	"
specimen G	58144	"	"

Occurrence: As with the other variant of Orientalia sp. 6-17, O. sp. 6-17 subsp. 2 is restricted in occurrence to the ?Late Kimmeridgian strata in the Lower Member of the Husky Formation.

Orientalia sp. 7-13

Pl. 29, figs. 17-25

Material: About 100 specimens in adequate state of preservation.

Description: Test free, small, elongate, slightly to moderately flaring from sharply pointed apex, rounded in cross-section; trochospirally coiled; early portion (2 to 3 whorls) with 5 to 6 chambers per whorl, later portion (3 to 4 whorls) quadriserial; test close coiled, periphery rounded, except in ultimate whorl when it might be slightly lobate; chambers rhomboidal in shape (ventrally), increasing very gradually in size as added, in ultimate whorl may be slightly inflated; sutures distinct, straight, slightly depressed; wall finely arenaceous with much cement, rather smoothly finished; aperture an arched, interior-marginal slit at the base of the ultimate chamber, commonly obscured in preservation.

Dimensions: (in mm)

	Height	Max Width
Figured specimen A	0.33	0.24
Figured specimen B	0.28	0.20
Figured specimen C	0.28	0.19
Figured specimen D	0.28	0.23
Figured specimen E	0.25	0.16
specimen F	0.21	0.15
specimen G	0.24	0.21

Remarks: Orientalia sp. 7-13 differs from O. sp. 6-17 and its variants in having a more elongate test, the apex of which is sharply pointed rather than being blunt and stubby. This gives the former a sleeker, more elongate (tapering) appearence in contrast to the chunkiness of O. sp. 6-17. In other respects, the forms are very similar.

O. sp. 7-13 differs from Eggerella (Eomarssonella) sp. cf. E. (E.) paraconica Levina in possessing four rather than three chambers in the ultimate whorl of the test.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58145	051404	176.0
Figured specimen B	58146	"	"
Figured specimen C	58147	"	"
Figured specimen D	58148	"	"
Figured specimen E	58149	"	"
specimen F	58150	"	"
specimen G	58151	"	"

Occurrence: *Orientalia* sp. 7-13 occurs in abundance in a single suite of ?Mid Portlandian age, located 176 m above the base of the Lower Member.

Suborder ROTALIINA Delage et Herouard, 1896
Superfamily NODOSARIACEA Ehrenberg, 1838
Family NODOSARIIDAE Ehrenberg, 1838
Subfamily NODOSARIINAE Ehrenberg, 1838
Genus *Astacolus* de Montfort, 1808

Astacolus sp. cf. *A. praesibirensis* Dain
Pl. 31, figs. 1-9

?*Astacolus praesibirensis* DAIN, 1972, p. 125, Pl. XLI, figs. 1-4.

Material: Ten specimens in good state of preservation.

Description: Test free, large, robust, strongly compressed, arcuate; planispirally coiled in early stage with a tendency to uncoil in the later portion, though all chambers reach back to the coil, periphery with a distinct keel; chambers numerous, up to 14 in most complete specimen available, though more may be present; low and broad, increasing rapidly in breadth, but only very slowly in height as added; sutures distinct, thickened, flush, oblique, moderately arcuate; wall calcareous, smooth, finely perforate; aperture at the end of the peripheral angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	1.08	0.70	0.28
Figured specimen B*	1.30+	0.85	0.38
Figured specimen C*	0.95+	0.65	0.29
Figured specimen D*	1.18+	0.83	0.38

* = broken specimen

Remarks: *Astacolus* sp. cf. *A. praesibirensis* Dain is similar in most respects to *A. praesibirensis* sensu stricto, but possesses a more distinct, thickened keel. The small number of (fragmentary) specimens available does not permit a closer identification. It differs from Astacolus arietis (Terquem) in being somewhat larger and much more strongly compressed, such that, in profile view, the test is parallel-sided rather than lenticular.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58152	051339	54.0
Figured specimen B	58153	"	"
Figured specimen C	58154	"	"
Figured specimen D	58155	"	"

Occurrence: Astacolus sp. cf. A. praesibirensis Dain was recovered from a single suite 54m above the base of the Lower Member, from beds of late Oxfordian to Kimmeridgian age.

Astacolus sp. 6-16

Pl. 31, figs. 10-14, 17, 18

Material: About 40 specimens in good state of preservation.

Description: Test free, medium-sized, strongly compressed, slightly arcuate; planispirally coiled in earlier portion with a tendency to uncoil in the later portion, though ultimate chamber normally reaches back to touch the coil; chambers numerous, 9 to 11 visible; low and broad, increasing rapidly in breadth but only slowly in height as added; sutures distinct, somewhat thickened, non-depressed (flush with wall), oblique; wall calcareous, smooth; aperture at the end of the peripheral angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.99	0.68	0.25
Figured specimen B	1.30	0.65	0.28
Figured specimen C	0.73	0.48	0.18
specimen D	0.60	0.41	0.15
specimen E	0.93	0.53	0.24
specimen F	0.70	0.44	0.20

Remarks: This species is similar to the *Astacolus sibirensis* - *praesibirensis* group from the Late Jurassic of western Siberia, but is generally somewhat smaller and possesses fewer chambers. It differs from *A.* sp. cf. *A. praesibirensis* Dain in being smaller, having fewer chambers and lacking a keel.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58156	051382	140.0
Figured specimen B	58157	"	"
Figured specimen C	58158	"	"
specimen D	58159	"	"
specimen E	58160	051386	152.0
specimen F	58161	051390	159.5

Occurrence: *Astacolus* sp. *6-16* occurs in small numbers (3 to 10 specimens) throughout the mid portion of the Lower Member.

Astacolus sp. *5-32*

Pl. 31, figs. 15, 16, 19, 20

Material: Rare.

Description: Test free, medium-sized, moderately compressed, lenticular in cross-section, arcuate; planispirally coiled in earlier portion with a tendency to uncoil in the later portion, periphery possesses fully to moderately developed keel; chambers numerous, about 9 in adult specimens, low and broad, increasing rapidly in breadth but rather slowly in height as added; sutures distinct, thickened, non-depressed, arcuate; wall calcareous, smooth, very finely perforate; aperture at the end of the peripheral angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.96	0.55	0.28
Figured specimen B	0.85	0.50	0.25

Remarks: Astacolus sp. 5-32 differs from A. sp. cf. A. praesibirensis Dain in being much smaller, possessing fewer chambers and having a lenticular cross-section. It differs from A. sp. 6-16 in being somewhat smaller and having a lenticular cross-section.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58162	051334	46.5
Figured specimen B	58163	051331	42.0

Occurrence: Astacolus sp. 5-32 occurs in the Lower Member rarely, in beds located 40 to 50 m above the base of the section.

Genus Citharina d'Orbigny, 1839

Citharina sp. 5-29

Pl. 33, figs. 1-7

Material: About 20 specimens, all of which are fragmentary.

Description: Test free, large, flattened, subtriangular in outline; peripheral margin varies from straight to slightly convex; chambers numerous, probably about 10 to 12 in adult specimens (estimated), increasing gradually in breadth as added but only very little in height so that later chambers are quite broad and low; sutures fairly distinct, thickened, slightly depressed, strongly oblique; wall calcareous, smooth, ornamented with low, fine, longitudinal costae, about 12 to 14 per side in adult specimens running from near base of test uninterruptedly across sutures over the distal margin to near the median point of the ventral face; aperture radiate produced on a short neck-like extension of the peripheral angle.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A(j)	0.88	0.36	0.15
Figured specimen B*	1.20+	0.60	0.21
Figured specimen C*	0.93+	0.50	0.18
specimen D*	1.13+	0.63	0.20
specimen E(j)*	0.70+	0.35	0.15

(j) = juvenile specimen
* = broken specimen

Remarks: Citharina sp. 5-29 resembles C. entypomatus Loeblich and Tappan from the Oxfordian of the western interior of North America in shape and general appearance. It differs from the latter in being about twice as large (up to 3mm in estimated reconstructions of specimens) and possessing fewer chambers in mature specimens. Because these large forms are very fragile, only juvenile specimens are preserved intact, while adults occur as fragments. Positive identification and comparison with described species is therefore difficult.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58164	051331	42.0
Figured specimen B	58165	"	"
Figured specimen C	58166	"	"
specimen D	58167	051334	46.5
specimen E	58168	051334	46.5

Occurrence: Citharina sp. 5-29 occurs in small numbers in suites located about 40m to 50m above the base of the Lower Member.

Citharina sp. 5-32

Pl. 36, figs. 1-6

Material: About 10 rather poorly preserved and fragmented specimens.

Description: Test free, small, strongly compressed, rounded triangular in outline, peripheral margin slightly convex; chambers numerous, 9 to 10 in adult specimens, increasing very rapidly in breadth as added but only very slightly in height, so that later chambers are broad and low; sutures distinct, moderately depressed, strongly oblique; wall calcareous, finely perforate, smooth; aperture at peripheral angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.38	0.28	0.063
Figured specimen B	0.28	0.14	0.04
Figured specimen C	0.25	0.16	0.05
specimen D*	0.30+	0.18	0.05
specimen E*	0.40+	0.33	0.05

* = broken specimen

Remarks: The test of Citharina sp. 5-32 is very fragile and highly susceptible to any strains imposed on it. Except for the single, almost complete specimen figured, most of the other available material consists of several chambers broken from the test. Citharina sp. 5-32 broadly resembles C. latissima Loeblich and Tappan in outline. It differs from the latter in being much smaller, more squat (i.e. closer to an equilateral triangle in shape) and apparently totally lacking ornamental costation. This lack of costae may however be a result of the very poor preservation of the forms as most of the specimens are preserved as steinkerns.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58169	051334	46.5
Figured specimen B	58170	051330	40.5
Figured specimen C	58171	"	"
specimen D	58172	"	"
specimen E	58173	"	"

Occurrence: Citharina sp. 5-32 occurs in small numbers in suites located 40m to 50m above the base of the Lower Member.

Genus Dentalina Risso, 1826

Dentalina sp. cf. D. ejuncida Loeblich and Tappan

Pl. 35, figs. 27, 28

?Dentalina ejuncida LOEBLICH and TAPPAN, 1950a, p. 48, Pl. 13, figs. 9-11.

Material: Rare.

Description: Test free, small, elongate, slightly arcuate, tapering; uniserial throughout, consisting of 6 to 7 chambers; chambers slightly inflated centrally, generally higher than broad, lacking overlap, expanding gradually in size as added; sutures distinct, fine, slightly constricted and rather strongly oblique; wall calcareous, very finely perforate, smooth; aperture terminal, radiate, eccentric.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.55	0.13
specimen B*	0.45+	0.08
Figured specimen C(j)	0.38	0.13

* = broken specimen
(j) = juvenile specimen

Remarks: *Dentalina* sp. cf. *D. ejuncida* Loeblich and Tappan differs from *D. ejuncida* s.s. in having fewer chambers in the adult test than the latter. It agrees well with *D. ejuncida* s.s. in both size and chamber arrangement, and is therefore tentatively assigned to the species.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58174	051333	45.0
specimen B	58175	051333	45.0
Figured specimen C	58176	051330	40.5

Occurrence: *Dentalina* sp. cf. *D. ejuncida* Loeblich and Tappan occurs only rarely, in suites located 40m to 50m above the base of the Lower Member.

Dentalina sp. 5-28

Pl. 35, figs. 9-11

Material: Rare, fragmentary in nature.

Description: Test free, large, elongate, axis slightly arcuate; uniserial throughout; consisting of 7 (or more) chambers; proloculus spherical with single apical horn; chambers initially closely appressed, wider than high, in later portion gradually becoming equant; ultimate chamber higher than wide; later chambers less appressed, slightly inflated centrally, rounded in cross-section; sutures distinct, fine, slightly constricted, somewhat oblique; wall calcareous, very finely perforate, smooth; aperture terminal, radiate, eccentric.

Dimensions: (in mm)

	Height	Width
Figured specimen A	1.05	0.25
Figured specimen B*	1.00+	0.29

* = broken specimen

Remarks: *Dentalina* sp. 5-28 is similar in size and appearance to *D. ejuncida* Loeblich and Tappan, though the latter lacks an apical horn and possesses more oblique sutures. D. *tortilis* Franke is similar in appearance, but rather smaller with fewer chambers.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58177	051330	40.5
Figured specimen B	58178	051330	40.5

Occurrence: *Dentalina* sp. 5-28 was found in a single suite in the basal portion of the Lower Member.

Dentalina sp. 5-29

Pl. 35, figs. 15, 16

Material: About 30 fragmentary to nearly complete specimens.

Description: Test free, small, elongate, slender, straight to slightly arcuate, rounded in section; proloculus rounded, may possess single apical horn; chambers initially about twice as broad as they are high, becoming equant or nearly so in later portion of test, somewhat centrally inflated, sutures distinct, non- to very slightly depressed, slightly to moderately oblique; wall calcareous, smooth, aperture terminal eccentric, radiate.

Dimensions: (in mm)

	Length	Greatest Width
Figured specimen A*	0.63+	0.16
Figured specimen B*	0.70+	0.16
specimen C*	0.53+	0.15
specimen D*	0.58+	0.15

* = Broken specimen

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58179	051330	40.5
Figured specimen B	58180	"	"
specimen C	58181	"	"
specimen D	58182	051334	46.5

Occurrence: Dentalina sp. 5-29 is restricted in occurrence to a zone 40m to 50m above the base of the Lower Member.

Dentalina sp. 5-30

Pl. 35, figs. 12, 13

Material: Single specimen.

Description: Test free, large, robust, elongate, slightly arcuate; uniserial; consisting of rounded proloculus followed by two rapidly expanding chambers which are higher than broad and rounded in cross-section; ultimate chamber slightly inflated, occupies 50% of test; sutures distinct, fine, very slightly depressed, horizontal; wall calcareous, smooth; aperture terminal, radiate, slightly eccentric.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.90	0.35

Remarks: Dentalina sp. 5-30, with its large, robust test and small number of chambers is distinct from any other species encountered in the Lower Member.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58506	051332	43.5

Occurrence: Dentalina sp. 5-30 was recovered from a suite located 43.5m above the base of the Lower Member.

Dentalina sp. 7-3

Pl. 35, fig. 14

Material: Three specimens.

Description: Test free, medium-sized, elongate; axis slightly arcuate, consisting of 4 to 5 chambers which expand rather slowly as added; chambers not inflated, higher than broad and rounded in cross-section;

sutures distinct, fine, slightly oblique; wall calcareous, smooth; aperture terminal, radiate, eccentric.

Dimensions:

	Height	Width
Figured specimen A	0.80	0.26
specimen B	0.74	0.23

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58509	051394	161.0
specimen B	58510	051394	161.0

Occurrence: *Dentalina* sp. 7-3 was recovered from a single suite located 161m above the base of the Lower Member at Martin Creek.

Dentalina sp. 5-32-1

Pl. 35, figs. 19-24

Material: Uncommon, about 35 specimens of which 10 are in a reasonable state of preservation.

Description: Test free, medium-sized, elongate, though rather stubby at both ends, axis straight to slightly arcuate, uniserial throughout; consisting of 3 to 4 chambers; proloculus stubby, with distinct, small, apical horn; chambers inflated, of approximately constant width, with height increasing gradually throughout ontogeny, such that ultimate chamber is about 50% higher than broad; chambers rounded to slightly ovate in section; sutures distinct, fine, not depressed, transverse to very slightly oblique; wall calcareous, smooth; aperture terminal, radiate, slightly eccentric.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.80	0.23
Figured specimen B	0.60	0.23
specimen C	0.55	0.23
specimen D	0.55	0.20
Figured specimen E	0.78	0.23
specimen F	0.69	0.23

Remarks: *Dentalina* sp. 5-32-1 is one of the few specimens of calcareous foraminifers to range throughout most of the Lower Member. Though a distinctive form, it is not similar to any described late Jurassic species.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58183	051334	46.5
Figured specimen B	58184	051333	45.0
specimen C	58185	"	"
specimen D	58186	"	"
Figured specimen E	58187	051330	40.5
specimen F	58188	051393	159.5

Occurrence: Dentalina sp. 5-32-1 occurs in small numbers throughout most of the Lower Member.

Dentalina sp. 5-32-2

Pl. 35, figs. 17, 18

Material: Very poor, only two complete specimens available for study, remainder fragmentary.

Description: Test free, small, slender, elongate; uniserial throughout; axis straight, initial chamber bluntly rounded; consisting of 5 to 6 chambers which are only slightly centrally inflated; chambers maintain constant width throughout ontogeny, while the height increases gradually such that chambers in the later portion of the test are roughly equidimensional; sutures distinct, very slightly constricted; transverse to slightly oblique; wall calcareous, smooth; aperture terminal, radiate, eccentric and produced on a slight neck.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.64	0.16
specimen B*	0.64+	0.19

* = broken specimen

Remarks: Dentalina sp. 5-32-2 is similar in size and appearance to D. sp. 5-29 but differs in being parallel-sided rather than tapering, possessing transverse rather than oblique sutures and lacking an apical horn.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58189	051334	46.5
specimen B	58190	051334	46.5

Occurrence: Dentalina sp. 5-32-2 occurs rarely in the Lower Member, in beds located 42m to 48m above the base.

Genus Geinitzinita Sellier de Civreaux et Dessauvagie, 1965

Geinitzinita praenodulosa Dain

Pl. 34, figs. 34-36

Geinitzinita praenodulosa DAIN, 1972, p. 108, Pl. XXXIII, figs. 1-5.

Frondicularia sp. TAPPAN, 1955, p. 82, Pl. 27, fig. 10.

Lingulina sp. cf. L. hybrida Frentzen SOUAYA, 1976, p. 280, Pl. 3, figs. 4a-b.

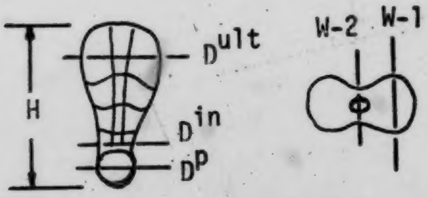
Frondicularia tumida? Terquem SOUAYA, 1976, p. 278, Pl. 4, figs 2a-b.

Material: Fairly common, about 25 complete or nearly complete tests available for study.

Description: Test free, medium-sized, not compressed, gently tapering; uniserial and rectilinear throughout, proloculus spherical (commonly 0.075 - 0.10mm in diameter), followed by about 4 to 6 low, rather rapidly expanding chambers; chambers are broadly ovate in outline, convex at the periphery and concave at the median point, the medial depression occupies up to one half of the chamber width, is more deeply impressed at the base of the chamber and smoothes out at the aperture; the borders of this furrow-like depression are outlined by clear, ridge-like swellings; sutures distinct, fairly wide, slightly depressed and characteristically chevron-shaped; wall calcareous, finely perforate, surface smooth; aperture simple, terminal, oval.

Dimensions: (in mm)

	Diam^p	Diam^{in}	D^{ult}	Width^1	Width^2	Height
Hypotype A	0.09	0.11	0.24	0.19	0.13	0.53
Hypotype B	0.10	0.13	0.21	0.16	0.10	0.49
Hypotype C	0.075	0.10	0.28	0.20	0.14	0.58
Hypotype D	0.075	0.09	0.21	0.15	0.11	0.41



Remarks: The Husky specimens of Geinitzinita praenodulosa Dain compare favorably in all respects with the original material described from the Upper Oxfordian - Kimmeridgian of western Siberia, although our forms seldom possess more than five chambers in the adult specimens. Occasional larger, less tapering heteromorphs resemble G. nodulosa (Fursenko et Polenova).

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	58191	051330	40.5
Hypotype B	58192	051330	40.5
Hypotype C	58193	051331	42.0
Hypotype D	58194	051331	42.0

Occurrence: Geinitzinita praenodulosa Dain occurs in small numbers throughout the Lower Member at Martin Creek.

Genus Ichtyolaria Wedekind, 1937

Ichtyolaria(?) sp. 29131

Pl. 34, figs. 32, 33

Material: Two specimens.

Description: Test free, medium-sized, robust, sharply tapering; lateral sides convex, with clear medial depression along axis of test, uniserial; chambers few, five in number starting from spherical proloculus; chambers bisymmetrical, lobate, broader than high, increasing quite rapidly in size as added; ultimate chamber occupies some 35% of adult test; sutures distinct, fine, flush, swinging sharply upwards in central portion of test; wall calcareous, finely perforate, smooth, ornamented with six strong, distinct longitudinal costae that run from the apex of the test, without interruption to the ultimate chamber; aperture terminal, rounded, radiate(?).

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.75	0.53	0.38

Remarks: Loeblich and Tappan (1964) considered the genus Ichtyolaria Wedekind to be a synonym of Frondicularia Defrance. The form is, however, sufficiently different in test shape (particularly in cross-section) to merit separation from the latter.

The form differs from Ichtyolaria tjumenika Tylkina in being much broader for any given height and in lacking the auxiliary costae possessed by the former.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58195	029131	131-137

Occurrence: The lone specimen of Ichtyolaria(?) sp. 29131 was recovered from a channel sample taken at 131m to 137m above the base of the Lower Member.

Genus Lenticulina Lamarck, 1804

Lenticulina gerkei Dain

Pl. 34, figs. 5-12

Lenticulina gerkei DAIN, 1972, p. 117, Pl. XXXVI, figs. 7a-b.

Material: Over 50 tests in excellent state of preservation.

Description: Test free, medium-sized; planispirally coiled, lenticular (biconvex) in cross-section, periphery subacute, biumbilicate, umbilical areas may be slightly depressed; chambers numerous, increasing gradually in size as added; ultimate and penultimate (and very rarely also antepenultimate) chambers commonly moderately inflated in the basal portions of each chamber where it approaches the umbilicus; 8 to 9 chambers in ultimate whorl; face of ultimate chamber rounded triangular in outline with rounded angles, slightly convex; sutures distinct, fine, radial, curved rather strongly against direction of coiling, smooth; wall calcareous, hyaline, finely perforate, smooth; aperture at the peripheral angle, radiate, may be slightly elevated on short neck.

Dimensions: (in mm)

	Height	Width	Thickness
Hypotype A	0.51	0.40	0.23
Hypotype B	0.48	0.43	0.21
Hypotype C	0.50	0.44	0.26
Hypotype D	0.48	0.38	0.23

	Height	Width	Thickness
Hypotype E	0.45	0.33	0.21
Hypotype F	0.41	0.28	0.19
Hypotype G	0.40	0.30	0.21

Remarks: Rare specimens of Lenticulina gerkei Dain exhibit a tendency to slightly trochospiral (Darbyella-like) coiling (Hypotype C), but this is only poorly developed and the forms still clearly belong to Lenticulina. The inflation of the umbilical portions of the chambers is quite variable, with some specimens exhibiting little or no swelling, while others (e.g. Hypotype G) show considerable distortion of the distal ends of the chambers.

The Husky specimens of Lenticulina gerkei Dain are somewhat smaller than the form illustrated by Dain (Dain et. al., 1972) but otherwise agree well with the diagnosis provided by the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	58196	051330	40.5
Hypotype B	58197	"	"
Hypotype C	58198	"	"
Hypotype D	58199	"	"
Hypotype E	58200	051334	46.5
Hypotype F	58201	"	"
Hypotype G	58202	"	"

Occurrence: Lenticulina gerkei Dain occurs quite commonly in beds located 40m to 50m above the base of the Lower Member.

Lenticulina sp. cf. L. audax Loeblich and Tappan

Pl. 33, figs. 11, 24-26

?Lenticulina audax LOEBLICH and TAPPAN, 1950a, p. 43, Pl. 11, figs. 18-21.

Material: About 40 tests in varying states of preservation.

Description: Test free, medium to large sized, planispirally coiled, involute, test usually prominently biumbonate, umbos clear; periphery subacute, peripheral margin keeled; chambers numerous, only ultimate whorl normally visible, consists of 9 to 10 chambers in adult specimens; terminal face rounded triangular in section with fairly sharp angles on sides, not inflated; sutures distinct, radial, thickened, flush with wall of test, gently curved against the direction of coiling; wall calcareous, hyaline, finely perforate, smooth; aperture at the peripheral angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.80	0.70	0.43
Figured specimen B	0.73	0.65	0.38
Figured specimen C	0.88	0.75	0.50
specimen D	0.85	0.65	0.50
specimen E	1.00	0.85	0.50
specimen F	0.95	0.80	0.60

Remarks: Lenticulina sp. cf. L. audax Loeblich and Tappan is similar to L. sp. 5-29-B but the latter is somewhat larger and lacks the distinctive clear umbos of the former. L. sp. cf. L. audax Loeblich and Tappan is similar in size and design to Lenticulina audax Loeblich and Tappan from the Oxfordian of the west-interior of North America. It differs from the latter in having a lesser number of chambers in the ultimate whorl (9 to 10 versus 12 to 15 respectively) and being proportionately wider for a given height.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58203	051331	42.0
Figured specimen B	58204	051331	42.0
Figured specimen C	58205	051331	42.0

	GSC Type No.	GSC Field Loc.	H.A.B. (meters)
specimen D	58206	051331	42.0
specimen E	58207	"	"
specimen F	58208	"	"

Occurrence: *Lenticulina* sp. cf. *L. audax* Loeblich and Tappan occurs in small numbers in the mid portion of the Lower Member.

Lenticulina sp. *5-29-B*

Pl. 34, figs. 1-4

Material: Some 50 specimens in good state of preservation.

Description: Test free, large, lenticular; planispirally coiled and involute; only ultimate whorl normally visible; periphery subacute, peripheral margin strongly keeled; chambers numerous, expanding very gradually in size as added; about 9 to 11 in ultimate whorl; apertural face sharply triangular with slightly rounded lateral sides, flat; sutures distinct, radial, slightly thickened, flush, curved backwards against direction of coiling; wall calcareous, hyaline, finely perforate, smooth; aperture located at peripheral angle, on a small, indistinct node, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	1.18	0.93	0.55
specimen B	0.85	0.74	0.41
Figured specimen C	0.78	0.64	0.33
specimen D	0.95	0.88	0.48
Figured specimen E	0.63	0.55	0.38
specimen F	0.78	0.58	0.28

Remarks: *Lenticulina* sp. *5-29-B* is similar in size and design to *L. audax*

Loeblich and Tappan, but differs in being totally involute, possessing fewer chambers in the ultimate whorl, and lacking the prominent, clear umbos of the latter. It is similar in most respects to Lenticulina lauta Dain from the Kimmeridgian of western Siberia, but cannot be assigned to this species with certainty because Dain (1972) neglects to mention in her diagnosis whether L. lauta is keeled or not. One could infer from her illustrations (Dain, op. cit., Pl. XXXVII, fig. 1) that L. lauta does indeed possess a keel along the peripheral margin, but this is not mentioned in the diagnosis.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58209	051331	42.0
specimen B	58210	"	"
Figured specimen C	58211	"	"
specimen D	58212	"	"
Figured specimen E	58213	"	"
specimen F	58214	"	"

Occurrence: Lenticulina sp.5-29-B occurs in small numbers in suites located 40m to 50m above the base of the Lower Member.

Lenticulina sp. 5-32

Pl. 33, figs. 15, 16, 19-22, 27

Material: Fairly rare.

Description: Test free, medium-sized, lenticular; planispirally coiled and involute, though in some specimens the later portion of the test may be uncoiled; periphery sharply angular, peripheral margin with a thin though distinctive keel; chambers numerous, expanding gradually as added, 11 to 12 in ultimate whorl of adult specimens, terminal face rather sharply triangular with only slightly to non-rounded lateral sides, may appear flat to slightly concave; sutures distinct, radial, limbate, flush, moderately curved against direction of coiling with the maximum inflection occurring close to umbilicus; wall calcareous, hyaline, finely perforate, smooth; aperture at peripheral angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.65	0.53	0.29
specimen B	0.65	0.50	0.28
specimen C(j)	0.48	0.35	0.23
specimen D	0.65	0.48	0.26
specimen E(j)	0.49	0.36	0.29
Figured specimen F**	0.58	0.36	0.24
Figured specimen G**	0.83	0.52	0.35
specimen H**	0.50	0.40	0.23

(j) = juvenile specimen ** = uncoiling variant

Remarks: In specimens that are wholly planispiral, the terminal face remains "sharp and flat" as described in the diagnosis. However, in forms that exhibit a tendency to uncoil in the later portion, this is no longer the case. Here (Figured specimen F, G; specimen H) the apertural face becomes rounded triangular in outline, with the lateral sides becoming moderately inflated; because the keel is no longer present, the base of the chamber is flat.

Lenticulina sp. 5-32 differs from L. gerkei Dain in having a sharper, more acute periphery, possessing a keel, and more numerous chambers in the ultimate whorl, and lacking the umbilically inflated chambers of the latter. It bears some resemblance to L. undosa Beljaevskaja, but differs in being somewhat larger and possessing more numerous chambers in the ultimate whorl (11 to 12 versus 8 to 9).

whorl (11 to 12 versus 8 to 9).

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58215	051334	46.5
specimen B	58216	"	"
specimen C	58217	"	"
specimen D	58218	"	"
specimen E	58219	"	"
Figured specimen F	58220	"	"
Figured specimen G	58221	051331	42.0
specimen H	58222	"	"

Occurrence: *Lenticulina* sp. 5-32 occurs in small numbers in suites located 40m to 50m above the base of the Lower Member.

Lenticulina sp. 7-3

Pl. 33, figs. 8-10, 12-14

Material: Over 50 specimens in good state of preservation.

Description: Test free, large, lenticular, planispirally coiled and wholly involute; periphery subacute, peripheral margin not keeled; chambers numerous, expanding gradually in size as added, about 10 to 11 in the ultimate whorl of mature specimens, apertural face triangular with rounded angles, slightly inflated; sutures rather indistinct, thickened (limbate), radial, flush, rather strongly curved backward against direction of coiling; wall calcareous, finely perforate, smooth; aperture located at peripheral angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	1.08	0.76	0.52
Figured specimen B	1.28	0.80	0.46
specimen C	0.98	0.75	0.38
specimen D	0.80	0.58	0.38
specimen E	0.96	0.68	0.46
specimen F	1.15	0.80	0.50

Remarks: Lenticulina sp. 7-3 closely resembles L. splendita Beljaevskaja from the Lower Kimmeridgian of western Siberia in all aspects, except that the latter seems to possess a peripheral keel. It differs from L. wisniowskii (Myatliuk) in being considerably larger and possessing more chambers in the ultimate whorl.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58223	051394	161.0
Figured specimen B	58224	"	"
specimen C	58225	"	"
specimen D	58226	"	"
specimen E	58363	"	"
specimen F	58364	"	"

Occurrence: Lenticulina sp. 7-3 occurs in small numbers in silty and sandy beds located 158m to 165m above the base of the Lower Member.

Genus Marginulina d'Orbigny, 1826

Marginulina brevis Paalzow

Pl. 35, figs. 29-32

Marginulina brevis PAALZOW, 1922, p. 21, Pl. 2, fig. 18; TAPPAN, 1955, p. 58, Pl. 18, fig. 14.

Material: Rare, 3 well preserved specimens.

Description: Test free, small, subovate in outline, subtriangular in cross-section, being narrower at the outer margin and thicker at the inner margin; margins rounded; chambers few, five in mature specimens, low and broad, increasing fairly slowly in size as added, except for the ultimate chamber, which occupies 33% to 50% of the test; sutures distinct, fine, flush to slightly depressed, oblique; wall calcareous, finely perforate, smooth; aperture at the dorsal angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Hypotype A	0.55	0.25	0.20
Hypotype B	0.39	0.20	0.15
Hypotype C(j)*	0.33+	0.20	0.18

(j) = juvenile specimen
* = broken specimen

Remarks: Tappan (1955) obtained and described only two specimens of *Marginulina brevis* Paalzow from a core of Upper Jurassic Kingak Shale in northern Alaska. This coupled with Paalzow's (1922) holotype makes for only six specimens of *M. brevis* recovered to date. The specimens recovered from the Lower Member of the Husky Formation agree well with Paalzow's original type in size and are slightly slimmer than the forms illustrated by Tappan.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	58365	051331	42.0
Hypotype B	58366	051332	43.5
Hypotype C	58367	051332	43.5

Occurrence: *Marginulina brevis* Paalzow occurs in small numbers in suites located approximately 40m to 45m above the base of the Lower Member.

Marginulina sp. cf. M. breviformis (Terquem and Berthelin)

Pl. 35, figs. 25, 26

?Marginulina breviformis (Terquem and Berthelin) TAPPAN, 1955, p. 58, Pl. 18, figs. 2, 3.

Material: Rare, five specimens in adequate state of preservation.

Description: Test free, medium-sized, robust, stout, rounded in cross-section; about 5 to 6 chambers in adult specimens, early chambers tiny, broader than high, increasing more rapidly in breadth than in height; ultimate chamber occupies 33% to 50% of test; sutures distinct, slightly depressed, moderately oblique; wall calcareous, finely perforate, smooth; aperture located at the dorsal angle, radiate.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.63	0.30
Figured specimen B*	0.70+	0.45
specimen C	0.45	0.26

* = Broken specimen

Remarks: The Husky specimens of Marginulina sp. cf. M. breviformis (Terquem and Berthelin) differ from those illustrated by Tappan (1955) in possessing only slightly depressed, less oblique sutures and having somewhat more greatly inflated chambers. In other respects the forms are quite similar.

M. sp. cf. M. breviformis (Terquem and Berthelin) differs from M. brevis Paalzow in possessing more greatly inflated, rounded chambers, whereas the chambers of the latter are low and broad.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (meters)
Figured specimen A	58368	051334	46.5
Figured specimen B	58369	051334	46.5
specimen C	58370	051330	40.5

Occurrence: Marginulina sp. cf. M. breviformis (Terquem and Berthelin) occurs rarely in suites located 40m to 50m above the base of the Lower Member.

Genus Marginulinopsis A. Silvestri, 1904

Marginulinopsis sp. 6-21

Pl. 35, figs. 4-8

?Vaginulinopsis riavkinoensis KOSYREVA in Dain et. al., 1972, p. 134, Pl. XXXIX, figs. 5-9.

Material: Quite common, over 40 tests in poor to good state of preservation.

Description: Test free, medium-sized, elongate; initial portion close-coiled, evolute, consisting of 5 to 6 chambers which increase in size rather slowly as added; later portion straight, rectilinear, uniserial; consisting of 3 to 4 chambers, chambers broader than high (height to width ratio = 1 : 1.5), rounded to broadly ovate in section, slightly centrally inflated, increasing gradually in size as added, ultimate chamber may be slightly more inflated than previous; sutures distinct, highest on dorsal side, slightly thickened, somewhat depressed, arched against direction of coiling in initial portion, slightly oblique in uniserial portion; wall calcareous, hyaline, finely perforate, smooth, ornamented with up to 22 low (often indistinct) fine, longitudinal costae that run uninterrupted across sutures and may occasionally bifurcate or coalesce; aperture at dorsal angle, rounded, radiate.

Dimensions: (in mm)

	Height	Coil Width	Uniserial Width
Figured specimen A	0.55	0.25	0.21
specimen B	0.50	0.24	0.24
specimen C	0.53	0.25	0.21
specimen D	0.45	0.25	0.23
specimen E	0.46	0.28	0.24
Figured specimen F	0.63	0.25	0.23
specimen G	0.53	0.26	0.23
Figured specimen H	0.50	0.25	0.23
specimen I	0.48	0.28	0.23

Remarks: *Marginulinopsis* sp. *6-21* is a distinctive, elegant form that occurs, along with one variant, in the so-called "*Saracenaria* cf. *cypha* Zone" in the Lower Member. It is possibly conspecific with *M*. sp. *5-32* but the preservation of the latter is so poor that no direct comparison can be made with the material available.

Marginulinopsis sp. *6-21* differs from *M*. *phragmites* Loeblich and Tappan in being somewhat smaller and possessing more numerous, lower and more indistinct longitudinal costae. It bears close resemblance to *M*. *jonesi* (Reuss), but appears to bear somewhat denser costation. The two species are quite similar in other aspects however, and *M*. sp. *6-21* may well be conspecific with *M*. *jonesi* (Reuss).

The Russian form *Vaginulinopsis* *rjavkinoensis* Kosyreva closely resembles *Marginulinopsis* sp. *6-21* in all diagnostic features, although the test is somewhat more compressed. One assumes that it is for this reason that Kosyreva (in Dain *et*. *al*, 1972) placed the species in *Vaginulinopsis* rather than in *Marginulinopsis*. The illustrations of *V*. *rjavkinoensis* Kosyreva show a form with only moderately compressed chambers, such that, in the author's opinion,the species could probably be assigned to either genus. It is possible that *Marginulinopsis* sp. *6-21* and *Vaginulinopsis* rjavkinoensis Kosyreva are indeed the same species.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58371	051387	155.0
specimen B	58372	"	"
specimen C	58373	"	"
specimen D	58374	051388	156.5
specimen E	58375	"	"
Figured specimen F	58376	051390	159.5
specimen G	58377	"	"
Figured specimen H	58378	051392	158.0
specimen I	58379	"	"

Occurrence: Marginulinopsis sp. 6-21 occurs in fair numbers in the upper portions of the Lower Member, in suites ranging from 155m to 165m above the base. These beds carry a Buchia fauna diagnostic of mid to late Portlandian age.

Marginulinopsis sp. 6-21 subsp. 1

Pl. 35, figs. 1-3

Material: Rare, about 10 specimens in good state of preservation.

Description: Test free, medium-sized, elongate; initial portion close-coiled, evolute, consisting of 5 to 6 slowly expanding chambers, forms about 20% of total test; later portion uniserial, straight, rectilinear, rounded in section, consisting of 4 to 5 chambers; chambers broader than high, slightly to moderately centrally inflated, expanding very gradually in size as added, ultimate chamber usually subglobular, quite strongly inflated; sutures distinct, slightly thickened, flush and radial in coiled portion, slightly to moderately depressed in uniserial portion, transverse to somewhat oblique; wall calcareous, finely perforate, ornamented with up to 20 distinct, low, fine, longitudinal costae which run the entire length of the test and may be bent at the sutures, costae occasionally bifurcate or coalesce; aperture at dorsal angle, produced on distinct node, oval, radiate.

Dimensions: (in mm)

	Height	Coil Width	Uniserial Width
Figured specimen A	0.68	0.25	0.23
Figured specimen B	0.66	0.20	0.18
specimen C	0.68	0.26	0.26
specimen D(j)	0.46	0.23	0.23
specimen E(j)	0.41	0.20	0.20

(j) = juvenile specimen

Remarks: Marginulinopsis sp. 6-21 subsp. 1 differs from M. sp. 6-21 in being slightly larger, having a more strongly inflated, subglobular to tear-drop shaped ultimate chamber, and possessing a distinct, rather large apertural node. Gradations from the latter to the former occur in all the suites studied, such that the two forms are obviously closely related.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58380	051394	161
Figured specimen B	58381	"	"
specimen C	58382	"	"
specimen D	58383	051392	158
specimen E	58384	"	"

Occurrence: Marginulinopsis sp. 6-21 subsp. 1 occurs in small numbers in suites located 158m to 161m above the base of the Lower Member.

Marginulinopsis sp. 5-28

Pl. 36, figs. 17, 18

Material: Single specimen.

Description: Test free, small, elongate; initial portion close-coiled, evolute, consisting of 4 rapidly expanding chambers; later portion uniserial, straight and rectilinear, consisting of three chambers; chambers about equant, rounded in cross-section, slightly centrally inflated and increasing rather slowly in size as added; sutures indistinct, fine, very slightly depressed; wall calcareous, smooth, originally ornamented with few fine, longitudinal costae; aperture indeterminate as ultimate chamber missing, but probably terminal and radiate.

Dimensions:

	Height	Width	Thickness
Figured specimen A	0.44+	0.18	0.15

Remarks: The single specimen of Marginulinopsis sp. 5-28 is too poorly preserved to warrant direct comparison with established species. It is similar in appearence to M. sp. 6-21, but is somewhat smaller and possesses less dense costation.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58389	051330	40.5

Occurrence: Marginulinopsis sp. 5-28 was recovered from a suite located 40.5m above the base of the Lower Member at Martin Creek.

Marginulinopsis sp. 5-32

Pl. 36, fig. 16

Material: Ten specimens in poor to fair state of preservation, mostly preserved as steinkerns.

Description: Test free, small elongate; initial portion close-coiled, evolute; consisting of 3 to 4 rather rapidly expanding chambers; later portion uniserial, straight, rectilinear, consisting of 2 to 4 chambers; chambers broader than high (height to width ratio = 1 : 1.5), rounded in cross-section, slightly centrally inflated, increasing in size rather slowly as added, ultimate chamber usually slightly more inflated than the rest; sutures distinct, fine, somewhat recurved against direction of coiling in early portion, flush; in later portion nearly straight and slightly depressed; wall calcareous, finely perforate(?), some hints remain that the surface was covered with fine longitudinal costae, but the preservation does not allow further elaboration; aperture at dorsal angle, radiate.

Dimensions: (in mm)

	Height	Coil Width	Uniserial Width
Figured specimen A	0.40	0.24	0.21
specimen B	0.50	0.25	0.23
specimen C	0.34	0.21	0.19
specimen D	0.35	0.20	0.18

Remarks: Due to poor preservation, the exact nature of the wall ornamentation - if any was present - is difficult to determine. In Figured specimen A, there are hints of fine longitudinal costae along the coiled initial portion, but these are only poorly preserved.

The nature of preservation makes direct comparison of Marginulinopsis sp. 5-32 with other species difficult. The form is quite similar to

M. sp. 6-21 in general layout, although it is slightly smaller and possesses fewer chambers in both the coiled and uniserial portions. Inadequate preservation of the wall makes closer comparison impossible.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58385	051334	46.5
specimen B	58386	051334	46.5
specimen C	58387	051332	43.5
specimen D	58388	051332	43.5

Occurrence: Marginulinopsis sp. 5-32 occurs rarely (mostly in ones or twos) in suites located 40m to 50m above the base of the Lower Member.

Genus Nodosaria Lamarck, 1812

Nodosaria orthostoecha Loeblich and Tappan

Pl. 36, figs. 13, 14

?Nodosaria cf. corallina Gumbel, WICKENDEN, 1933, p. 165, Pl. 2, fig. 11.

Nodosaria orthostoecha LOEBLICH and TAPPAN, 1950b, p. 11, Pl. 1, figs. 33a-b; WALL, 1960, p. 89, Pl. 13, fig. 19; BROOKE and BRAUN, 1972, Pl. 11, figs. 44-46.

Material: Rare.

Description: Test free, small to tiny, elongate, uniserial, rectilinear; consisting of up to five chambers (usually only 2 to 3 due to fragile nature of test); chambers strongly centrally inflated, subglobular, expanding rather gradually in size as added; sutures distinct, fine, strongly constricted, transverse; wall calcareous, very finely perforate, surface ornamented by a maximum of 13 to 14 quite coarse longitudinal costae; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Length	Maximum Width
Hypotype A	0.48	0.16
Hypotype B*	0.25+	0.18
Hypotype C*	0.15+	0.18
Hypotype D*	0.23+	0.14

* Broken specimen

Remarks: Nodosaria orthostoecha Loeblich and Tappan is very similar to N. lirulata Loeblich and Tappan, but differs in having chambers that are smaller and sutures that are slightly less constricted. Though the form occurs only rarely in the Lower Member of the Husky Formation (less than 10 individuals recovered in total) it is quite distinctive and easily recognizable.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	58390	051330	40.5
Hypotype B	58391	"	"
Hypotype C	58392	"	"
Hypotype D	58393	051331	42.0

Occurrence: Nodosaria orthostoecha Loeblich and Tappan occurs only rarely in the basal half of the Lower Member.

Nodosaria sp. cf. N. amphigya Loeblich and Tappan

Pl. 36, fig. 15

?Nodosaria amphigya LOEBLICH and TAPPAN, 1950a, p. 48, Pl. 13, figs. 15-16.

Material: Very rare, all fragmentary.

Description: Test free, small, elliptical, rounded in cross-section; consisting of single chamber which is about twice as high as it is broad, slightly tapering at both ends; wall calcareous, finely perforate, ornamented with a maximum of 8 to 10 fairly fine, longitudinal costae; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Height	Width
Figured specimen A*	0.36+	0.18
specimen B*	0.23+	0.13

* Broken specimen

Remarks: *Nodosaria* sp. cf. *N. amphigya* Loeblich and Tappan is probably referable to *N. amphigya* sensu stricto, but due to poor preservation of the available material, no direct comparison is made.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58394	051336	49.5
specimen B	58395	051331	42.0

Occurrence: *Nodosaria* sp. cf. *N. amphigya* Loeblich and Tappan occurs only rarely (as single specimens) in the basal half of the Lower Member.

Nodosaria sp. 5-28

Pl. 34, figs. 23, 24

Material: Three fragmentary specimens in good state of preservation.

Description: Test free, medium-sized, elongate; uniserial, though preserved as a series of single chambers due to fragile nature of test; chambers globular, drawn out to fine neck on which is situated the aperture; nature of sutures not apparent due to fragmentary preservation; wall calcareous, very finely perforate, smooth; aperture at the end of a distinct neck, rounded, radiate.

Dimensions:

	Height	Width
Figured specimen A	0.30	0.23
specimen B	0.30	0.24
Figured specimen C	0.35	0.23

Remarks: A complete specimen of *Nodosaria* sp. 5-28 probably closely resembles *Nodosaria rugosa* Ten Dam. It differs from the latter in having a smoothly finished rather than a roughened wall.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58396	051330	40.5
specimen B	58397	051330	40.5
Figured specimen C	58398	051331	42.0

Occurrence: The three specimens referable to *Nodosaria* sp. 5-28 occur in suites located 40.5m to 42.0 m above the base of the Lower Member.

Nodosaria sp. 5-34

Pl. 34, fig. 17

Material: Single specimen.

Description: The fragmentary test is small and consists of three chambers (initial portion missing) which are arranged in an uniserial, rectilinear fashion; the chambers are closely appressed, slightly centrally inflated and broader than high, the ultimate chamber is about equidimensional; sutures are distinct, transverse and finely depressed; the wall is calcareous and ornamented with 12 longitudinal costae of which 6 are distinct and sharp (primary costae) and the remainder rather low (secondary costae), the secondary costae are intercalated between the primary ones; the aperture is simple, terminal, rounded and produced on a slight neck.

Dimensions: (in mm)

	Height	Width
Figured specimen A*	0.40+	0.28

*Broken specimen

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58399	051336	49.5

Occurrence: *Nodosaria* sp. 5-34 was recovered from a suite located 49.5m above the base of the Lower Member.

Genus *Planularia* Defrance, 1824

Planularia(?) sp. 7-3

Pl. 32, figs. 32-39

Vaginulina(?) sp. A, WALL, 1960, p. 98, Pl. 6, figs. 7-9.

Material: About 50 specimens in good state of preservation, many fragmentary specimens besides.

Description: Test free, small, strongly compressed, very slightly arcuate; partially (incompletely) planispirally coiled in the early portion, tending to uncoil in the later portion, though all chambers reach back to the "coil"; chambers broad and low, increasing very rapidly in breadth but only gradually in height as added, about 8 to 9 in mature forms; sutures distinct, slightly thickened, non-depressed, slightly arcuate, initially almost horizontal, becoming strongly oblique in the later portion; wall calcareous, very finely perforate, smooth; aperture at the peripheral angle, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.58	0.30	0.15
Figured specimen B	0.65	0.33	0.13
Figured specimen C	0.65	0.31	0.15
Figured specimen D	0.59	0.39	0.15
Figured specimen E(j)	0.46	0.31	0.13
Figured specimen F	0.80	0.30	0.14

(j) Juvenile specimen

Remarks: The actual distinctions between the genera Astacolus Montfort and Planularia Defrance, other than the latter being "more compressed" than the former, are rather nebulous. Russian workers examining the Foraminifera of the Upper Jurassic of western Siberia (Dain et. al., 1972) seem to interchange these two taxa almost at will. In this study, the term Planularia is taken to include Astacolus-like forms which are very strongly compressed and have a partially developed (vestigial or "evolute") planispiral portion. The presence or absence of a keel, suggested as a diagnostic genetic criterion by Loeblich and Tappan (Loeblich and Tappan, 1964,

p. C522) is regarded as being of little value.

Planularia(?) sp. 7-3 closely resembles Vaginulina(?) sp. A Wall from the Vanguard Formation of southern Saskatchewan. It is virtually identical with the latter form in physical appearance (particularly in the vestigial coil), but has rather fewer chambers (8 to 9 versus 12 to 13). It is interesting to note that Wall (Wall, 1960, p. 98) also had trouble in assigning a genus to this species, as the lack of a completely planispiral coil made its placement in the genus Astacolus untenable. However, the compressed nature of the test made the assignment to Vaginulina also questionable.

Planularia(?) sp. 7-3 differs from P. lidigrigia Kosyreva in being smaller, having fewer chambers, and possessing a vestigial coiled portion. It bears some affinities to Astacolus pediacus Tappan, but is more strongly compressed, and has, on the whole, fewer chambers in the adult test.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58400	051394	161
Figured specimen B	58401	"	"
Figured specimen C	58402	"	"
Figured specimen D	58403	"	"
Figured specimen E	58404	"	"
Figured specimen F	58405	051387	155

Occurrence: Planularia(?) sp. 7-3 occurs quite commonly in the upper portion of the Lower Member within the silty sands possibly equivalent to the Porcupine River Formation (about 155 to 165m above the base).

Genus Pseudonodosaria Boomgaart, 1949

Pseudonodosaria brandi (Tappan)

Pl. 34, figs. 25, 26

Rectoglandulina brandi TAPPAN, 1955, p. 74, Pl. 26, fig. 12.

Pseudonodosaria brandi (Tappan) DAIN, 1972, p. , Pl. XXXIV, figs. 1-4, 6; SOUAYA, 1976, p. 280, Pl. 8, fig. 16.

Material: Fairly common.

Description: Test free, medium-sized, robust, uniserial and rectilinear throughout; broadly rounded at base; earlier chambers closely appressed, ultimate chamber rounded, occupies 33% to 50% of test, adult forms consist of 3 to 4 chambers; sutures indistinct, transverse, brought in flush with wall; wall calcareous, smoothly finished; aperture terminal, radiate.

Dimensions: (in mm)

	Initial Diameter	Ultimate Diameter	Height
Hypotype A	0.16	0.28	0.45
Hypotype B	0.16	0.30	0.51
Hypotype C	0.16	0.29	0.55
Hypotype D	0.14	0.26	0.43
Hypotype E	0.18	0.21	0.36
Hypotype F	0.13	0.20	0.31

Remarks: Pseudonodosaria brandi (Tappan) was first described from the Upper Jurassic of the north slope of Alaska. Subsequently it has been reported from the Upper Oxfordian to Lower Kimmeridgian of western Siberia (Dain et. al, 1972) and the late Callovian of the Canadian Arctic Archipelago (Souaya, 1976). In the present study it appears to be restricted to beds of a general late Oxfordian to Kimmeridgian age.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	58406	051333	45.0
Hypotype B	58407	"	"
Hypotype C	58408	"	"
Hypotype D	58409	051331	42.0
Hypotype E	58410	051330	40.5
Hypotype F	58411	051330	40.5

Occurrence: Pseudonodosaria brandi (Tappan) occurs in modest numbers in the Oxfordian to Kimmeridgian portions of the Lower Member.

Pseudonodosaria(?) sp. aff. P. quinquecostata (Bornemann)

Pl. 36, figs. 9, 10

?Rectoglandulina quinquecostata (Bornemann) TAPPAN, 1955, p. 75, Pl. 26, figs. 17, 18.

Material: Single specimen.

Description: Test free, small, compressed, uniserial, tapering; consisting of five strongly appressed chambers; chambers much broader than high, expanding rapidly in size as added, generally ovate in cross-section; sutures indistinct, strongly arched in between the costae (in the shape of an inverted 'V'), slightly depressed; wall calcareous, finely perforate, hyaline, ornamented with six strong, distinct, longitudinal costae that run the full length of the test, and only fade at the top of the ultimate chamber; aperture terminal, ovate.

Dimensions: (in mm)

	Length	Width	Thickness
Figured specimen A	0.43	0.25	0.14

Remarks: The generic assignment of *Pseudonodosaria*(?) sp. aff. *P. quinquecostata* (Bornemann) is not certain due to the peculiar shape assumed by the septal sutures. These resemble sharp inverted 'V's between each pair of costae so that assignment to the genera *Frondicularia* or *Ichtyolaria* seems out of the question (though the ornament and test shape would seem to point in this direction). The present form does, however, bear close resemblence to *Pseudonodosaria quinquecostata* (Bornemann) as interpreted by Tappan (1955). The Husky specimen is however strongly compressed, and somewhat smaller than Tappan's form and for this reason is not compared directly with the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58412	051334	46.5

Occurrence: *Pseudonodosaria*(?) sp. aff. *P. quinquecostata* (Bornemann) occurs as a single specimen in a suite located 46.5m above the base of the Lower Member.

Pseudonodosaria sp. 5-28

Pl. 34, figs. 18-20

Material: Rare, generally well preserved.

Description: Test free, small, short, sharply tapering; composed of 3 to 5 chambers in uniserial arrangement; proloculus has single, fine apical spine, ultimate chamber about twice as high as the preceeding; sutures not distinct, flush, moderately arched between the costae; wall calcareous, finely perforate, surface ornamented with 6 to 7 longitudinal costae, which run down to apical spine; aperture terminal, simple, rounded, produced on short neck.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.61	0.38
Figured specimen B	0.48	0.28

Remarks: *Pseudonodosaria* sp. 5-28 bears a strong resemblance to specimens identified by Tappan (1955) as *Rectoglandulina* (=*Pseudonodosaria*) *quinquecostata* (Bornemann) from the Lower Jurassic of northern Alaska. Inasmuch as *P. quinquecostata* (Bornemann) is regarded as a Lower Jurassic form, no direct comparison is made at this time.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (meters)
Figured specimen A	58413	051330	40.5
Figured specimen B	58414	051330	40.5

Occurrence: *Pseudonodosaria* sp. 5-28 occurs in small numbers in suites located from 40m to 42m above the base of the Lower Member.

Pseudonodosaria sp. 6-24

Pl. 34, figs. 30, 31

Material: Rare, 5 specimens in adequate state of preservation, others fragmentary.

Description: Test free, large, elongate, rounded in cross-section; uniserial and rectilinear throughout; consisting of 7 to 8 chambers which initially are closely embracing, later much less so; proloculus shaped like a blunt cone, followed by 4 to 5 chambers which are closely appressed, and about twice as broad as they are high; last 2 to 3 chambers subrounded, centrally inflated, equant, loosely appressed; sutures distinct, fine, slightly depressed, transverse; wall calcareous, finely perforate, smooth; aperture terminal, radiate.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.93	0.24
Figured specimen B	1.08	0.28

Remarks: Pseudonodosaria sp. 6-24 differs from P. sp. 7-1 in being somewhat smaller, lacking a tapering test, and possessing ultimate chambers which are not closely appressed. It differs from Nodosaria detruncata Schwager in being twice as large and possessing more numerous chambers.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58415	051390	159.5
Figured specimen B	58416	051330	40.5

Occurrence: Pseudonodosaria sp. 6-24 occurs rarely as single specimens throughout the Lower Member.

Pseudonodosaria sp. 7-1

Pl. 34, figs. 13-16, 21, 22

Material: Fairly common, generally well preserved.

Description: Test free, large, robust, gently tapering; uniserial and rectilinear throughout, periphery smooth rounded in cross-section; broadly rounded at base; about 6 to 7 chambers in mature forms; initial 4 to 5 chambers closely appressed, about twice as broad as they are high; ultimate and rarely, penultimate chambers becoming more equant and rather rounded; sutures distinct, fine, flush (not depressed), transverse; wall calcareous, smooth, aperture terminal, radiate.

Dimensions: (in mm)

	Initial Diam	Ultimate Diam	Height
Figured specimen A	0.18	0.31	0.90
Figured specimen B	0.16	0.30	0.71
Figured specimen C	0.16	0.29	0.70
specimen D	0.15	0.30	0.74
specimen E	0.16	0.29	0.75
Figured specimen F	0.16	0.26	0.75

Remarks: Pseudonodosaria sp. 7-1 differs from P. brandi (Tappan) in being about twice as large and possessing more numerous chambers (5 to 7 versus 3 to 4 respectively). It is similar in general dimensions to P. tutkovski (Myatliuk), but has more rounded, equant, ultimate and penultimate chambers.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58417	051392	158
Figured specimen B	58418	"	"
Figured specimen C	58419	"	"
specimen D	58420	051394	161
specimen E	58421	"	"
Figured specimen F	58422	"	"

Occurrence: Pseudonodosaria sp. 7-1 occurs in small numbers in silty sands 155m to 165m above the base of the Lower Member.

Genus Saracenaria Defrance, 1825

Saracenaria phaedra Tappan

Pl. 36, figs. 19-23; Pl. 37, figs. 1-4

Saracenaria phaedra TAPPAN, 1955, p. 64, Pl. 26, figs. 2; GORDON, 1967, p. 452, Pl. 2, figs. 17-18.

Material: About 25 specimens in various states of preservation.

Description: Test free, small, elongate, early portion faintly coiled, later becoming uniserial with chambers highest at the dorsal margin and triangular in cross-section, margins very slightly to non-carinate; chambers low and broad, expanding gradually as added, increasing more rapidly in breadth than in height, about 8 to 10 in adult specimens, with 3 to 5 in coil and remainder in uniserial portion; terminal face rounded triangular in section, slightly convex; sutures somewhat limbate, flush, gently curved back against direction of coiling (in coil) to nearly straight in uniserial portion; wall calcareous, hyaline, finely perforate, smooth; aperture located at the peripheral angle, radiate.

Dimensions: (in mm)

	Height	Diam Uniserial	Diam Coil	Breadth Face
Hypotype A	0.58	0.23	0.15	0.25
Hypotype B	0.44	0.20	0.15	0.18
Hypotype C	0.40	0.18	0.14	0.14
Hypotype D	0.34	0.19	0.14	0.15
Hypotype E	0.33	0.18	0.13	0.15

Remarks: Saracenaria phaedra Tappan was defined on the basis of a single specimen recovered from the Upper Jurassic Kingak Shale of northern Alaska.

That particular specimen shows rather well developed keels along the three margins of the test. The Husky forms also show some development of these keels, but to a lesser degree than does Tappan's form. The coiled portion of the test is quite small, and rarely occupies more than 20% or 25% of the total test length. Tappan (1955) commented on the differences between the present form, *Saracenaria topagorukensis* Tappan and *S. oxfordiana* Tappan.

Saracenaria phaedra Tappan differs from *S.* sp. *5-28* in possessing more rigidly triangular uninflated chambers and in having marginal keels. It differs from *S.* sp. *5-29A* in having more numerous, strictly angular chambers than the latter.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Hypotype A	58423	051331	42.0
Hypotype B	58424	"	"
Hypotype C	58425	051334	46.5
Hypotype D	58426	051334	46.5
Hypotype E	58427	"	"

Occurrence: *Saracenaria phaedra* Tappan occurs in small numbers 40m to 50m above the base of the Lower Member.

Saracenaria sp. cf. *S. cypha* Loeblich and Tappan

Pl. 32, figs. 15-22

?*Saracenaria cypha* LOEBLICH and TAPPAN, 1950a, p. 54, Pl. 14, figs. 9-12.

Material: About 50 tests in adequate state of preservation.

Description: Test free, medium-sized, elongate; early portion planispirally coiled, involute, later portion becoming uniserial with chambers highest at the dorsal margin and subtriangular in cross-section (i.e. triangular with rounded corners); chambers low and broad, expanding gradually in size as added and more rapidly in breadth than in height, about 8 to 9 in adult specimens with 4 to 5 in coiled portion and remainder in uniserial portion; sutures distinct, slightly thickened, flush, gently curved back against direction of coiling; wall calcareous, finely perforate, smooth, aperture located at peripheral angle, radiate.

Dimensions: (in mm)

	Height	Diam Uni	Diam Coil	Breadth Face
Figured specimen A	0.88	0.40	0.25	0.30
Figured specimen B	0.68	0.35	0.25	0.29
Figured specimen C	0.60	0.31	0.25	0.28
Figured specimen D	0.70	0.34	0.25	0.30
Figured specimen E	0.68	0.39	0.25	0.26
Figured specimen F	0.54	0.30	0.18	0.24

Remarks: Saracenaria sp. cf. S. cypha Loeblich and Tappan differs from the original in being somewhat larger and possessing slightly fewer chambers. Additionally, the sutures in the former are flush, whereas in S. cypha s.s. they are depressed. Superficially, the form resembles a "scaled up" version of S. phaedra Tappan, though the chambers are much more rounded in section and the form lacks marginal keels.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58428	051392	158
Figured specimen B	58429	051392	158
Figured specimen C	58430	"	"
Figured specimen D	58431	"	"
Figured specimen E	58432	"	"
Figured specimen F	58433	"	"

Occurrence: Saracenaria sp. cf. S. cypha Loeblich and Tappan occurs in fair numbers in beds 152m to 162m above the base of the Lower Member.

Saracenaria sp. cf. S. cypha Loeblich and Tappan var. 1

Pl. 32, figs. 23-27

?Saracenaria cypha LOEBLICH and TAPPAN, 1950a, p. 54, Pl. 14, figs. 9-11.

Material: About 15 specimens in good state of preservation.

Description: Test free, medium-sized, elongate; early portion planispirally coiled, later portion becoming uniserial with chambers highest at the dorsal margin and subtriangular (i.e. triangular with rounded angles) in cross-section; chambers low and broad, expanding gradually in size as added, but more rapidly in breadth than in height; uniserial portion chambers slightly to moderately inflated with the ultimate chamber being about 33% to 50% smaller than the preceding chambers; about 10 to 12 chambers in adult specimens with 5 to 6 in coiled portion and remainder in uniserial portion; sutures distinct, slightly thickened, flush, gently curved back against direction of coiling; wall calcareous, finely perforate, smooth; aperture located at the peripheral angle, radiate.

Dimensions: (in mm)

	Height	D^{uni}	D^{coil}	Width^{max}	Width^{ult}
Figured specimen A	0.78	0.30	0.23	0.30	0.26
Figured specimen B	0.74	0.25	0.20	0.30	0.24
specimen C*	0.63+	0.25	-	0.26	0.20
specimen D*	0.65+	0.25	-	0.26	0.16
specimen E	0.78	0.28	0.21	0.28	0.23
specimen F*	0.78	0.25	-	0.28	0.28

D^{uni} = Diameter of uniserial section
D^{coil} = Diameter of coiled portion
Width^{max} = Maximum width of uniserial portion
Width^{ult} = Width of ultimate chamber
* = Broken specimen

Remarks: Saracenaria sp. cf. S. cypha Loeblich and Tappan var. 1 differs from S. sp. cf. S. cypha Loeblich and Tappan in possessing more chambers overall (10 to 12 versus 8 to 9) and in having an ultimate chamber which is narrower than the preceding chambers. The chambers in the uniserial portion of the former are also slightly inflated. Overall however, the two forms are rather similar, and are therefore included in the same species.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58434	051386	152.0
Figured specimen B	58435	"	"
specimen C	58436	051390	159.5
specimen D	58437	051392	158.0
specimen E	58438	051394	161.0
specimen F	58439	"	"

Occurrence: Saracenaria sp. cf. S. cypha Loeblich and Tappan var. 1 occurs occurs in small numbers in the upper portion of the Lower Member, in suites 152 m to 162 m above base.

Saracenaria sp. 7-3

Pl. 32, figs. 28-31

Material: About 25 specimens in good state of preservation.

Description: Test free, small to medium-sized, squat; early portion planispirally coiled; later portion tending to be slightly uncoiled with chambers highest at dorsal margin and subtriangular in cross-section (i.e. triangular with rounded corners); chambers low and broad, expanding gradually in size as added, though more rapidly in breadth than in height; chambers in 'uncoiled portion' rounded and slightly inflated; about 7 to 8 chambers in adult specimens, with 4 to 5 comprising the coil; sutures distinct, slightly thickened, flush, curved back against direction of coiling; wall calcareous, finely perforate, smooth; aperture located at the peripheral angle, oval, radiate.

Dimensions: (in mm)

	Height	Coil Diam	Uniserial Diam	Thickness
Figured specimen A	0.49	0.25	0.30	0.26
specimen B	0.51	0.23	0.25	0.28
specimen C	0.46	0.23	0.28	0.25
Figured specimen D	0.40	0.16	0.23	0.21
Figured specimen E	0.41	0.23	0.28	0.25
specimen F	0.46	0.21	0.25	0.24

Remarks: On initial inspection, specimens of Saracenaria sp. 7-3 were thought to represent juveniles of S. sp. cf. S. cypha Loeblich and Tappan. However, they were subsequently placed in a separate taxon for the following reasons. At a given stage of development (post coiled portion), the former is nearly always squat, whereas the latter exhibits early tendencies to become elongate and totally uncoiled. In the 'uniserial portion' of development all chambers in S. sp. 7-3 reach back to the vicinity of the coil, whereas those in S. sp. cf. S. cypha Loeblich and Tappan do not. The form is probably conspecific with - if not directly descended from - Saracenaria sp. 5-29A.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58440	051394	161.0
specimen B	58441	"	"
specimen C	58442	"	"
Figured specimen D	58443	051393	159.5
Figured specimen E	58444	"	"
specimen F	58445	"	"

Occurrence: Saracenaria sp. 7-3 occurs in fair numbers from 152m to

163m above the base of the Lower Member at Martin Creek.

Saracenaria sp. 5-28

Pl. 37, figs. 5, 6

Material: Rare, about 15 specimens in reasonable state of preservation.

Description: Test free, small, elongate, early portion faintly coiled, later portion becoming uniserial with chambers highest at the dorsal margin and rounded triangular in cross-section; chambers low and broad, expanding gradually as added in the coiled portion, rather more rapidly in the uniserial portion; chambers in the uniserial portion moderately to strongly inflated such that angles appear rounded to even slightly deformed; about 7 to 8 chambers in adult specimens, with 2 to 3 in coil and remainder in uniserial portion; ultimate chamber usually rather smaller than penultimate; sutures distinct, fine, usually flush but may be slightly depressed, gently curved back against direction of coiling; wall calcareous, finely perforate, smooth; aperture at the peripheral angle, radiate.

Dimensions: (in mm)

	Ht.	D^{coil}	D^{uni}	Thickness^{uni}	Thickness^{ult}
Figured specimen A	0.64	0.20	0.31	0.30	0.30
Figured specimen B	0.50	0.15	0.28	0.23	0.16
specimen C	0.45	0.13	0.23	0.20	0.16
specimen D	0.45	0.14	0.23	0.21	0.20

* = broken specimen
D^{coil} = diameter of coil
D^{uni} = diameter of uniserial section
Thickness^{uni} = thickness of uniserial portion
Thickness^{ult} = thickness of ultimate chamber

Remarks: Saracenaria sp. 5-28 has the same basic design and size as S. phaedra Tappan but differs in having fewer, more greatly inflated chambers and in lacking marginal keels. It is probably quite closely related to the latter form however.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58446	051330	40.5
Figured specimen B	58447	"	"
specimen C	58448	"	"
specimen D	58449	"	"

Occurrence: Saracenaria sp. 5-28 occurs in small numbers in beds located 39m to 50m above the base of the Lower Member.

Saracenaria sp. cf. S. phaedra Tappan

Pl. 37, figs. 7, 8

?Saracenaria phaedra TAPPAN, 1955, p. 64, Pl. 26, fig. 2.

Material: About 25 specimens in good state of preservation.

Description: Test free, small, squat; early portion faintly coiled, later becoming uniserial with chambers highest at dorsal margin and triangular in cross-section; margins non-carinate; chambers low and broad, tending to become somewhat inflated in latter portion of test; expanding gradually in size as added, about 5 to 7 in adult specimens, with 3 to 4 in coil and remainder in uniserial portion; terminal face rounded triangular in section, moderately inflated, convex; sutures distinct, fine, flush to slightly depressed, slightly recurved against direction of coiling; wall calcareous, smooth, very finely perforate; aperture located at the terminal angle, radiate.

Dimensions: (in mm)

	Height	Diam Uni.	Diam Coil	Breadth Face
Figured specimen A	0.44	0.25	0.18	0.25
Figured specimen B	0.40	0.23	0.16	0.20
specimen C	0.41	0.30	0.18	0.23
specimen D	0.39	0.20	0.15	0.23

Remarks: Saracenaria sp. cf. S. phaedra Tappan differs from S. phaedra sensu stricto in having fewer chambers and possessing a strongly inflated (rounded) ultimate chamber. The forms are closely related however, and have the same vertical range.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58450	051331	42.0
Figured specimen B	58451	051331	42.0
specimen C	58507	"	"
specimen D	58508	"	"

Occurrence: Saracenaria sp. cf. S. phaedra Tappan occurs in small numbers in suites located 40m to 50m above the base of the Lower Member at Martin Creek.

Genus Vaginulinopsis Silvestri, 1904

Vaginulinopsis sp. cf. V. enodis Loeblich and Tappan

Pl. 32, figs. 6-10

?Vaginulinopsis enodis LOEBLICH and TAPPAN, 1950a, p. 46, Pl. 12, figs. 11-16.

Vaginulinopsis sp. cf. V. enodis Loeblich and Tappan, SOUAYA, 1976, p. 280, Pl. 7, fig. 12.

Material: About 10 specimens in good state of preservation.

Description: Test free, medium-sized, elongate, ovate in cross-section; early portion planispirally coiled, evolute, consisting of 5 to 6 chambers, later portion uncoiling, straight, to slightly arcuate, moderately compressed, composed of 3 to 4 chambers; chambers low and broad, increasing rapidly in size as added; very slightly to non-inflated though ultimate chamber may be quite substantially inflated; sutures distinct, very slightly thickened, flush to slightly depressed, strongly arcuate in coiled portion, less so in uniserial portion; wall calcareous, hyaline, finely perforate, smooth; aperture terminal, at dorsal angle, oval, radiate.

Dimensions: (in mm)

	Height	Coil Diam	Uniserial Diam	Thickness
Figured specimen A	0.69	0.38	0.30	0.23
Figured specimen B	0.88	0.40	0.40	0.28
Figured specimen C	0.55	0.25	0.30	0.23
specimen D	0.63	0.35	0.34	0.25

Remarks: Vaginulinopsis sp. cf. V. enodis Loeblich and Tappan closely resembles the original in size and general design but has fewer chambers in both the coil and uniserial portions. It is probably conspecific with the form figured by Souaya (1976) as V. sp. cf. V. enodis Loeblich and Tappan from the Upper Jurassic of the Canadian Arctic Archipelago.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58452	051394	161
Figured specimen B	58453	"	"
Figured specimen C	58454	"	"
specimen D	58455	051392	158

Occurrence: Vaginulinopsis sp. cf. V. enodis Loeblich and Tappan occurs rarely in the upper portion of the Lower Member in suites located 158m to 161m above base.

Vaginulinopsis sp. 6-10

Pl. 32, figs. 1-5

Material: About 25 specimens in adequate state of preservation, though mostly fragmentary.

Description: Test free, large, robust, ovate in cross-section; early portion close-coiled as in *Lenticulina* commonly with about 9 to 12 chambers in coil, later portion straight, rectilinear, moderately compressed, composed of 4 to 6 chambers; chambers low and broad, increasing quite rapidly in size as added; sutures distinct, thickened, non-depressed (flush), strongly arcuate in coiled portion, less so, though still oblique, in rectilinear portion; wall calcareous, smooth; aperture terminal, at dorsal angle, radiate.

Dimensions: (in mm)

	Height	Coil Diam	Uniserial Diam	Thickness
Figured specimen A*	1.75+	0.75	0.60	0.43
Figured specimen B*	1.28+	0.60	0.55	0.38
specimen C*	1.25+	-	0.60	0.41
specimen D*	0.96+	0.50	0.38	0.28
specimen E*	1.30+	0.60	0.60	0.38
specimen F*	0.98+	0.61	0.53	0.33

* = broken specimen

Remarks: *Vaginulinopsis* sp. 6-10 is similar in general appearance to *V. eritheles* Loeblich and Tappan from the Callovian of the western interior of North America. It differs from the latter in being nearly twice as large and possessing more chambers in the uniserial portion (4 to 6 versus 2 to 4).

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58456	051376	122
Figured specimen B	58457	"	"
specimen C	58458	"	"
specimen D	58459	"	"
specimen E	58460	051386	152
specimen F	58461	051387	155

Occurrence: Vaginulinopsis sp. 6-10 occurs in small numbers rather sporadically in beds located 120m to 160m above the base of the Lower Member.

Vaginulinopsis sp. 7-3

Pl. 32, figs. 11-14

Material: Rare, four specimens in an adequate state of preservation.

Description: Test free, medium-sized, elongate, moderately compressed, ovate in section; initial portion close-coiled, evolute, consisting of 3 to 4 chambers which expand rather gradually in size as added; later portion uniserial, straight and rectilinear, consisting of 4 to 5 chambers; chambers compressed, ovate in section, broader than high, expanding gradually in size as added, ultimate chamber may be slightly inflated; sutures distinct, flush, radial in coiled portion, becoming rather limbate in uniserial portion, slightly arched and moderately oblique; wall calcareous, finely perforate, hyaline, smooth; aperture at the dorsal angle, radiate.

Dimensions: (in mm)

	Height	Coil Diam	Uniserial Diam	Thickness
Figured specimen A	0.74	0.25	0.28	0.21
Figured specimen B	0.70	0.30	0.25	0.21
specimen C(j)	0.55	0.18	0.21	0.18
specimen D	0.58	0.26	0.23	0.18

(j) = juvenile specimen

Remarks: Vaginulinopsis sp. 7-3 differs from V. sp. cf. V. enodis Loeblich and Tappan in being much slimmer and possessing more chambers in the uniserial portion. From V. epicharis Loeblich and Tappan it differs in possessing much less arcuate sutures in the uniserial portion, that do not reach back to the umbilicus.

Vaginulinopsis sp. 7-3 strongly resembles V. thomasi Wall from the Upper Vanguard Formation (Oxfordian) of Saskatchewan, and differs only in possessing sutures that are less strongly oblique than Wall's form. The juvenile (specimen C) most probably technically belongs to the genus Vaginulina d'Orbigny as the coiling is incompletely planispiral, but as only a single specimen was recovered, the erection of a separate taxonomic classification was felt to be unjustified.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58462	051394	161.0
Figured specimen B	58463	"	"
specimen C	58464	"	"
specimen D	58465	051392	158.0

Occurrence: Vaginulinopsis sp. 7-3 occurs rarely in the upper portion of the Lower Member in suites located about 160 meters above base.

Family POLYMORPHINIDAE d'Orbigny, 1839

Subfamily POLYMORPHININAE d'Orbigny, 1839

Genus *Eoguttulina* Cushman and Ozawa, 1930

Eoguttulina sp.

Pl. 31, figs. 21-25

Material: Fairly common, though generally poorly preserved.

Description: Test free, medium-sized, fusiform; chambers biserially arranged, slightly inflated, increasing rapidly in size as added and rather strongly overlapping; final pair occupy about 50% of entire test; sutures distinct, very strongly oblique, flush to very slightly depressed; wall calcareous, surface smooth; aperture terminal, radiate.

Dimensions: (in mm)

	Height	Width	Thickness
Figured specimen A	0.58	0.34	0.25
Figured specimen B	0.53	0.34	0.28
Figured specimen C	0.53	0.25	0.24
Figured specimen D	0.48	0.25	0.25
specimen E	0.70	0.34	0.30
specimen F	0.54	0.33	0.25

Remarks: *Eoguttulina* sp. from the Lower Member of the Husky Forma- bears close resemblance to forms assigned by Dain (1972, Pl. XLVI, figs. 3-4) to *Eoguttulina* ex. gr. *E*. *inovroclaviensis* (Bielecka and Pozaryski) but is nearly twice as large. It differs from *E*. *liassica* (Strickland) in possessing more chambers in the adult form.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A		051394	161.0
Figured specimen B		051394	161.0
Figured specimen C		051330	40.5
Figured specimen D		051330	40.5
specimen E		051394	161.0
specimen F		051394	161.0

Occurrence: Eoguttulina sp. occurs erratically throughout the Lower Member. Preservation is almost inevitably poor, either as steinkerns or pyrite casts.

Genus Globulina d'Orbigny, 1839

Globulina sp.

Pl. 31, figs. 26-29

Material: Common, generally poorly preserved.

Description: Test free, small, tear-drop shaped; chambers in globuline arrangement, normally 2 to 3 visible, inflated and strongly overlapping; last chamber occupies 75% to 90% of test; sutures indistinct, flush, strongly oblique; wall calcareous, surface smooth; aperture terminal, radiate.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.44	0.30
Figured specimen B	0.40	0.28
Figured specimen C	0.41	0.29
Figured specimen D	0.38	0.26

Remarks: Although Globulina sp. is the commonest calcareous foraminifer encountered in the Lower Member, it s preservation is generally so poor that no definite species assignment can be made with confidence. Most specimens occur as either steinkerns or pyrite casts.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A		051331	42.0
Figured specimen B		051331	42.0
Figured specimen C		"	"
Figured specimen D		"	"

Occurrence: Globulina sp. occurs throughout the Lower Member.

Family GLANDULINIDAE Reuss, 1860

Subfamily GLANDULININAE Reuss, 1860

Genus Tristix MacFayden, 1941

Remarks: Loeblich and Tappan (1964), in defining the genus *Tristix* MacFayden, decided to include, as a junior synonym of the latter, the genus *Quadratina* Ten Dam. Apparently they felt (and supported with evidence) that *Quadratina* (with, in most cases, a quadrate section) was an aberrant variety of *Tristix* (with a triangular section). This was backed up by illustrations of forms that initially had a quadrate section and reduced this to a triangular section in the latter portion of test ontogeny.

In the Lower Member of the Husky Formation, two distinct forms exist in small numbers, the one with a pentagonal section, the other with a quadrate section. No examples of *Tristix* sensu MacFayden were recovered. The latter form could easily be ascribed to *Quadratina* Ten Dam, while the former may represent a hitherto undescribed genus. Because the forms are very scarce, no formal revision of *Tristix* is proposed but the following points are noted:

(1) The genus *Quadratina* is probably not (in all cases) an aberrant form of *Tristix*. Where transitional forms are not present, the former can be recognized as, at the very least, a subgenus of the latter.

(2) Utilizing the same arguments as for (1) above, the form tentatively described as *Tristix* (s.l.) sp. 6-20 could be raised to subgeneric rank.

Tristix sp. cf. T. inornata (Loeblich and Tappan)

Pl. 36, figs. 11, 12

?Quadratina inornata LOEBLICH and TAPPAN, 1950a, p. 54, Pl. 14, figs. 7a-b.

Material: Single specimen.

Description: Test free, small, elongate, quadrate in section, sides subparallel, tapering very slightly to base, faces moderately excavated, angles subacute, rounded; chambers fairly numerous, six in specimen, increasing gradually in size as added; sutures distinct, very slightly depressed, chevron-shaped (i.e. strongly arched centrally and curving downward at the angles of the chamber); wall calcareous, finely perforate, smooth; aperture terminal, rounded.

Dimensions: (in mm)

	Height	Maximum Width
Figured specimen A	0.30	0.15

Remarks: Tristix sp. cf. T. inornata (Loeblich and Tappan) varies from the original in being about half the size of the latter and possessing more strongly arched sutures. The chambers also appear to be more inflated along the angles than they are in Loeblich and Tappan's form.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58466	051392	155

Occurrence: Tristix sp. cf. T. inornata (Loeblich and Tappan) occurs as a single specimen in beds located 158 meters above the base of the Lower Member.

Tristix (s.l.) sp. _6-20_

Pl. 36, figs. 7, 8

Material: Two well preserved specimens.

Description: Test free, small, elongate, tapering; pentagonal in cross-section with rounded angles, faces strongly excavated, angles subacute; chambers numerous, uniserially arranged, 6 to 7 in adult specimens, increasing gradually in size from rounded(?) proloculus; sutures distinct, fine, very slightly depressed, strongly arched centrally, but curving downwards at the angles of the chambers; wall calcareous, very finely perforate, smooth; aperture simple, terminal, rounded.

Dimensions: (in mm)

	Height	Width
Figured specimen A	0.54	0.24
Figured specimen B	0.36	0.21

Remarks: _Tristix_ (s.l.) sp. _6-20_ does not fit the definition of _Tristix_ MacFayden very well, but has been provisionally assigned to the genus for the following reasons.

Loeblich and Tappan (1964) saw fit to include the genus _Quadratina_ Ten Dam as a junior synonym of _Tristix_ MacFayden. Although the former had (in most cases) chambers that were quadrate in section and the latter chambers that were triangular in section, Loeblich and Tappan (1950a) described forms that were intermediate between the two, and possessing characteristics of both genera in one test. Thus the generic diagnosis of _Tristix_ was altered to include tests which were "generally triangular in cross-section, but rarely quadrate".

The chambers in _Tristix_ (s.l.) sp. _6-20_ are pentagonal in cross-section and, as in _Tristix_ sensu MacFayden and _Quadratina_, the chambers have excavated faces. Since only two specimens of *T*. (s.l.) sp. *6-20* were recovered it seems premature to establish a new taxon on such meager materials. Thus, since forms with quadrate chambers have been included in *Tristix*, the present form, with pentagonal chambers, is likewise tentatively relegated to *Tristix*.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58467	051386	152.0
Figured specimen B	59468	051393	159.5

Occurrence: *Tristix* (s.l.) sp. *6-20* occurs very rarely in suites located 150m to 160 m above the base of the Lower Member.

Superfamily ROBERTINACEA Reuss, 1850

Family CERATOBULIMINIDAE Cushman, 1927

Subfamily CERATOBULIMININAE Cushman, 1927

Remarks: Apart from the Nodosariidae and the Glandulinidae, the only other family of calcareous foraminifers to contribute measureably to the foraminiferal fauna of the Lower Member of the Husky Formation is the Ceratobuliminidae. The tests of these forms are almost invariably poorly preserved (either severely recrystallized or, less commonly, pyritized), such that the nature of the aperture, an important criterion on the generic level, is very difficult to determine. Thus, generic assignments have been based, at least in part, on gross morphological similarity rather than apertural character. The Ceratobulimininae of the Lower Member are represented by the genera Conorboides(?), Ceratocancris, and Pseudolamarckina.

Genus Ceratocancris Finlay, 1939

Ceratocancris sp. cf. C. ambitiosus Dain

Pl. 38, figs. 4, 8, 12-21

?Ceratocancris ambitiosus DAIN, 1972, p. 176, Pl. LVI, figs. 1-2.

Material: Over 50 specimens in various states of preservation, majority pyritized.

Description: Test free, rather small, trochoid, low-spired; dorsal side gently convex ventral side planar to slightly depressed; peripheral margin rounded to slightly lobulate, composed of 1.5 to 2 whorls; consisting of spherical proloculus followed by 7 to 8 very rapidly expanding chambers, 5 to 6 in ultimate whorl; chambers trapezoidal in shape, wider on outer and narrower on inner margins, moderately dilated, each succeeding chamber about twice as large as the preceding ; sutures distinct, oblique on dorsal and radiate on ventral sides respectively, moderately to quite strongly depressed; wall calcareous, very finely perforate, smooth; aperture umbilical, slit-like, at base of flap produced by ultimate chamber, normally obscured.

Dimensions: (in mm)

	Max Diameter	Min Diameter	Height
Figured specimen A	0.28	0.23	0.13
Figured specimen B	0.28	0.20	0.13
Figured specimen C	0.29	0.23	0.12
specimen D	0.24	0.20	0.13
Figured specimen E	0.25	0.25	0.11
specimen F	0.23	0.23	0.10
specimen G	0.25	0.20	0.12
specimen H	0.25	0.20	0.10

Remarks: The form is very similar in size, chamber arrangement, etc., to Ceratocancris ambitiosus Dain from the Lower Kimmeridgian of western Siberia.

Due to poor preservation, however, a direct specific identification is not made as the exact nature of the aperture cannot be determined.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58469	051327	37.5
Figured specimen B	58470	051327	37.5
Figured specimen C	58471	051330	40.5
specimen D	58472	051331	42.0
Figured specimen E	58473	051331	42.0
specimen F	58474	051331	42.0
specimen G	58475	051333	45.0
specimen H	58476	051333	45.0

Occurrence: Ceratocancris sp. cf. C. ambitiosus Dain occurs in small numbers (2 to 5 specimens) in the basal half of the Lower Member in strata located 30m to 45m above base.

Genus Conorboides Hofker in Thalmann, 1952

Conorboides sp. 5-29

Pl. 37, figs. 9-16

Material: Common.

Description: Test free, small, moderate to quite high trochospire; plano-convex to very slightly concavo-convex in design; peripheral margin rounded; consisting of tiny spherical proloculus followed by 3.5 to 4 whorls of spire, 5 to 6 chambers in initial whorl reducing down to about 4 in the ultimate whorl; chambers slightly inflated, increasing gradually in size as added; all chambers visible dorsally, only the chambers of the ultimate whorl visible ventrally, embracing to umbilicus; sutures distinct, thickened (limbate) and strongly oblique dorsally, fine, radiate and slightly impressed ventrally; wall calcareous, hyaline, finely perforate, smooth; aperture umbilical, normally obscure due to preservation; where preserved appears to be a low, interior-marginal arch with a notch developed mid-way along the chamber face.

Dimensions: (in mm)

	Max Diameter	Min Diameter	Height
Figured specimen A	0.25	0.25	0.18
Figured specimen B	0.30	0.28	0.20
Figured specimen C	0.19	0.19	0.15
specimen D	0.25	0.25	0.18
specimen E	0.20	0.19	0.19
specimen F	0.28	0.26	0.18
specimen G	0.25	0.24	0.23
specimen H	0.19	0.19	0.15

Remarks: The species is tentatively assigned to the genus Conorboides due to its rather high spire, and some uncertainties as to the nature of the aperture. In other aspects, the form is similar to several species of the genus Pseudolamarckina present in contemporaneous deposits in western Siberia (Dain et. al., 1972). Externally it most closely resembles Pseudolamarckina liapinensis Dain but differs in possessing a smaller (0.25mm versus 0.50mm), more high-spired test, in which the number of chambers per whorl are reduced to 4 in adult specimens.

Both high-spired and moderate to quite low-spired variants exist. This may, in some way, reflect microspheric-megalospheric generations.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58477	051331	42.0
Figured specimen B	58478	"	"
Figured specimen C	58479	"	"
specimen D	58480	"	"
specimen E	58481	"	"
specimen F	58482	051327	37.5
specimen G	58483	"	"
specimen H	58484	"	"

Occurrence: Conorboides sp. 5-29 occurs in large numbers in the lower portion of the Lower Member, reaching its acme of development in suites located 30m to 45m above the base.

Genus Pseudolamarckina Myatliuk, 1959

Pseudolamarckina sp. cf. P. liapinensis Dain

Pl. 38, figs. 1-3, 5-7, 9-11

?Pseudolamarckina liapinensis DAIN, 1972, p. , Pl. LII, figs. 1-6; Pl. LIII, figs. 1-2; Pl. LV, figs. 1, 9.

Material: About 10 specimens, six of which are in an adequate state of preservation.

Description: Test free, small, trochospirally coiled, spire low to moderate; plano-convex; peripheral margin rounded to slightly lobulate; composed of 2 to 2.5 whorls of spire; consisting of spherical proloculus followed by 12 to 15 chambers, about 5 in ultimate whorl; chambers moderately inflated, increasing gradually in size as added; sutures distinct, limbate, highly oblique, slightly- to non-depressed on dorsal side, radial and slightly depressed on ventral side; wall calcareous, finely perforate(?), smoothly finished;

aperture interior-marginal slit adjacent to umbilicus, loop-shaped, though normally concealed by plate; remnant apertures on previous chambers may appear as small, elongate loops parallel to the direction of coiling.

Dimensions: (in mm)

	Max Diam	Min Diam	Height
Figured specimen A	0.30	0.26	0.10
Figured specimen B	0.30	0.26	0.09
specimen C	0.28	0.23	0.15
Figured specimen D	0.26	0.24	0.09
specimen E	0.25	0.23	0.09
specimen F	0.28	0.25	0.13

Remarks: Dain (Dain *et*. *al*., 1972) recognized three species of *Pseudolamarckina* of western Siberia: *P*. *liapinensis* Dain (Upper Kimmeridgian), *P*. *lopsiensis* Dain (Upper Kimmeridgian) and *P*. *voliaensis* Dain (Lower Volgian). The basis for distinguishing these species was "the nature of the apertural tooth-plate and the composition of the test wall" (Dain *et*. *al*., 1972, p. 169). The preservation of the material from the Lower Member does not allow for this "refinement of definition", such that distinguishing *P*. *liapinensis* Dain from *P*. *lopsiensis* Dain is very difficult. The Husky specimens are therefore tentatively assigned to *P*. *liapinensis* Dain on the basis of the external morphology.

Types:

	GSC Type No.	GSC Field Loc.	H.A.B. (Meters)
Figured specimen A	58485	051391	
Figured specimen B	58486	"	"
specimen C	58487	"	"
Figured specimen D	58488	051394	161
specimen E	58489	"	"
specimen F	58490	"	"

Occurrence: *Pseudolamarckina* sp. cf. *P*. *liapinensis* Dain occurs in small numbers in the upper portion of the Lower Member, in suites located 158m to 161m above the base of the section.

Superfamily SPIRILLINACEA Reuss, 1862

Family SPIRILLINIDAE Reuss, 1862

Subfamily SPIRILLININAE Reuss, 1862

Genus *Spirllina* Ehrenberg, 1843

Spirillina(?) sp. *6-16*

Pl. 34, fig. 27

Material: Single specimen.

Description: Test free, large; planispirally coiled; consisting of tiny, spherical proloculus followed by long, tubular, undivided second chamber; tube expands gradually in initial 3 to 4 volutions, and thereafter very rapidly in the last 3 to 4 volutions; about 7 to 8 whorls in the adult specimen; suture fairly distinct, slightly depressed; wall calcareous, appears to be imperforate rather than microgranular; aperture simple, formed by open end of tube.

Dimensions: (in mm)

	Diam	Thickness	Init Tube D	Final Tube D
Figured specimen A	1.33	0.23	0.018	0.35

Remarks: *Spirillina*(?) sp. *6-16* differs from *S.*(?) sp. *6-25* in being nearly twice as large and possessing more volutions in the coil. The former may however represent the adult form of the latter.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58497	051382	140.0

Occurrence: A single specimen of *Spirillina*(?) sp. *6-16* was recovered from the upper portion of the Lower Member at Martin Creek.

Spirillina(?) sp. 6-25

Pl. 34, figs. 28, 29

Material: Three specimens, two of which are pyrite molds.

Description: Test free, medium-sized; planispirally coiled; proloculus followed by closely-coiled, spirally wound, undivided, tubular second chamber which increases in diameter fairly rapidly with each additional volution, about 6 to 8 whorls in adult specimens; suture spiral, distinct, fine, flush in early volutions, becoming rather strongly depressed in later whorls; wall calcareous, hyaline, finely perforate; aperture formed by open end of tube.

Dimensions:

	Diam	Thickness	Tube Diam 1	Tube Diam 2
Figured specimen A	0.48	0.14	0.025	0.14
Figured specimen B	0.46	0.13	0.019	0.10
specimen C	0.46	0.10	0.006	0.06

Tube Diam 1 = Diameter tube in initial whorl
Tube Diam 2 = Diameter tube in ultimate whorl

Remarks: The sparse material available precludes a detailed evaluation of this form. The nature of the test wall (perforate versus imperforate) is difficult to determine due to the poor preservation, such that the generic assignment is tentative. Spirillina(?) sp. 6-25 differs from Spirillina amphelicta Loeblich and Tappan in being much larger and possessing a more rapidly expanding tube.

Types:

	GSC Type No.	GSC Field No.	H.A.B. (Meters)
Figured specimen A	58498	051391	161.0
Figured specimen B	58499	051389	158.0
specimen C	58500	051382	140.0

Occurrence: Spirillina(?) sp. 6-25 occurs rarely in suites located 140m to 160m above the base of the Lower Member.

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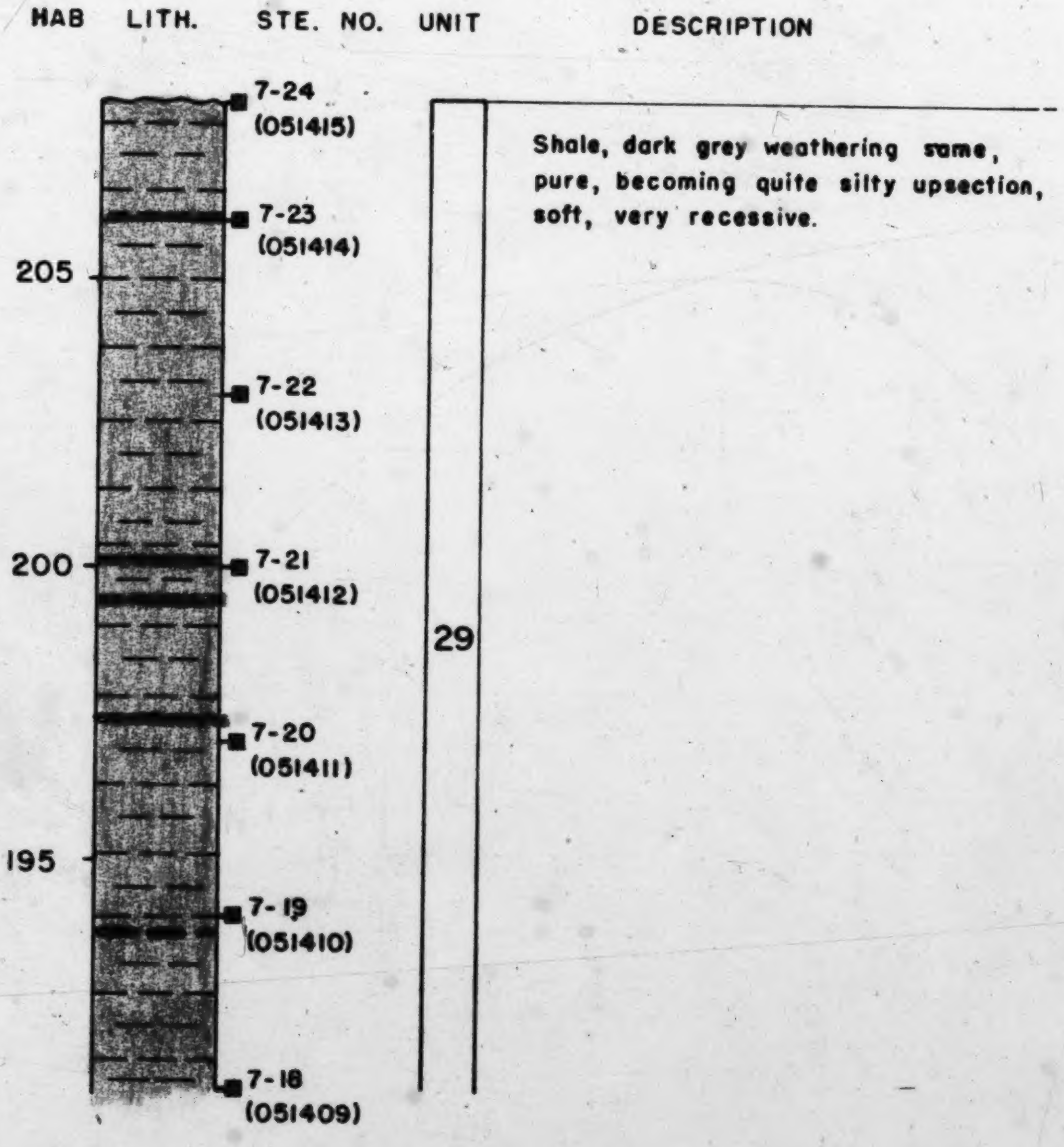
APPENDIX A

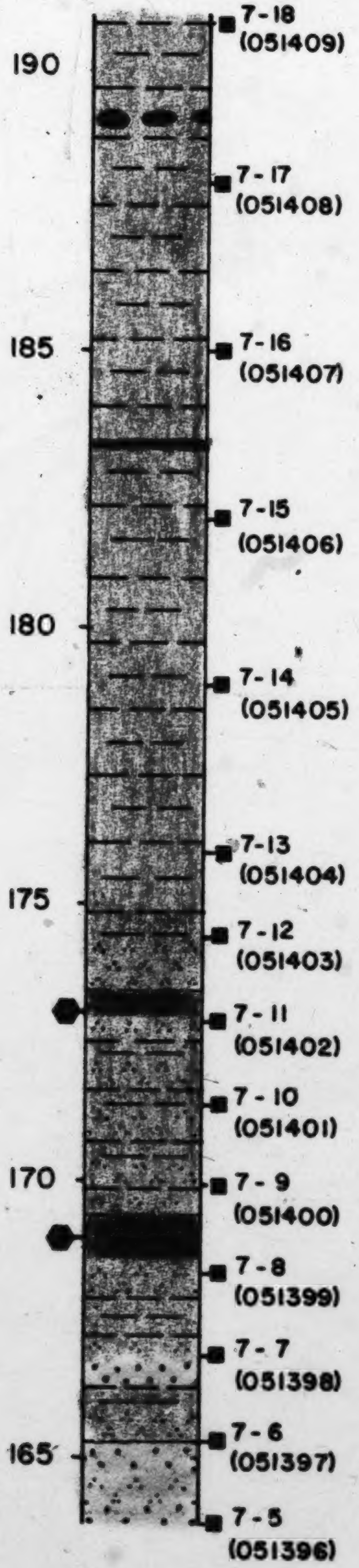
SAMPLE LOCATION and DESCRIPTION OF MEASURED SECTION

LITHOLOG OF SAMPLED SECTION
OF HUSKY FORMATION
AT MARTIN CREEK, AKLAVIK RANGE, D.O.M.
(GSC SECTIONS 75-5-5, 5-6 & 5-7)

VERTICAL SCALE: 1" = 3m.


HAB
LITH.
STE. NO.
UNIT
DESCRIPTION
205
200
195
7-24 (051415)
7-23 (051414)
7-22 (051413)
7-21 (051412)
7-20 (051411)
7-19 (051410)
7-18 (051409)
29

Shale, dark grey weathering same, pure, becoming quite silty upsection, soft, very recessive.


190
185
180
175
170
165
7-18 (051409)
7-17 (051408)
7-16 (051407)
7-15 (051406)
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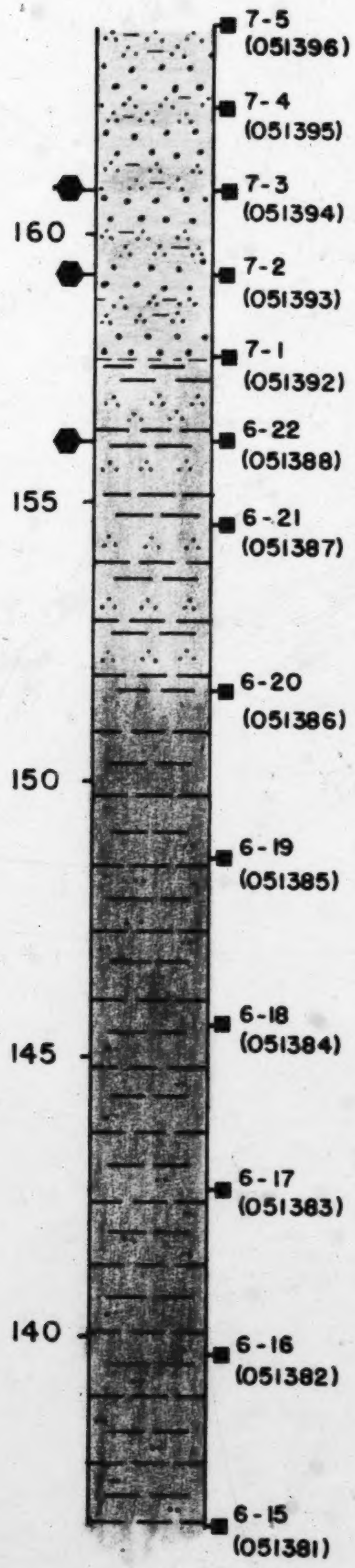
7-13 (051404)
7-12 (051403)
7-11 (051402)
7-10 (051401)
7-9 (051400)
7-8 (051399)
7-7 (051398)
7-6 (051397)
7-5 (051396)

29	Shale, as above
28	Siltstone, interbedded with similar silty to very silty shale, generally weathering dark to medium grey with several reddish-brown shale bands. More resistant than Unit 27.
27	Siltstone, similar to that of Unit 26, interbedded with dark grey, silty shale; more recessive than Unit 26. At 167m bed of fine grained buff sandstone.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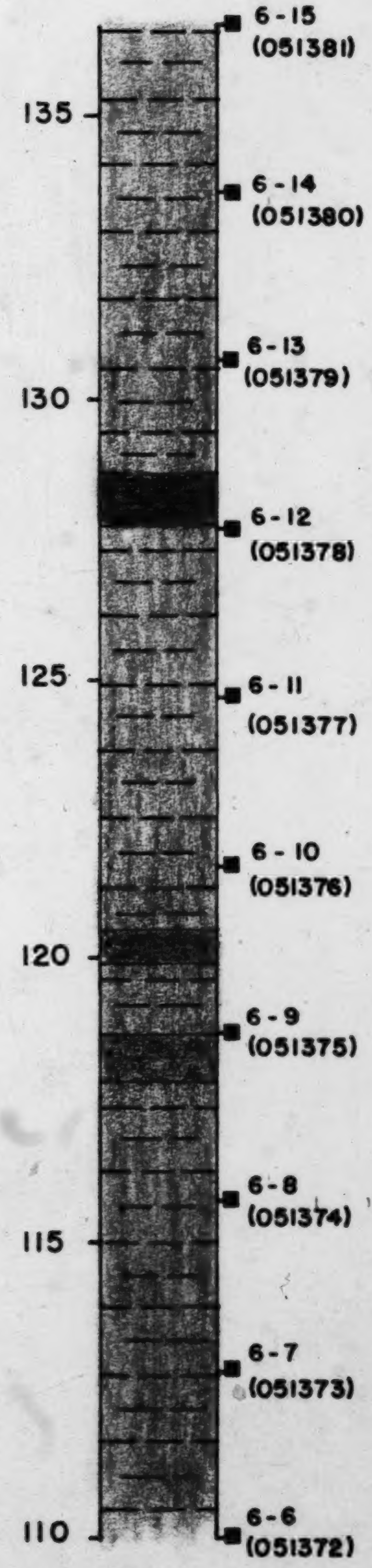
7-4
(051395)
7-3
(051394)
160
7-2
(051393)
7-1
(051392)
6-22
(051388)
155
6-21
(051387)
6-20
(051386)
150
6-19
(051385)
6-18
(051384)
145
6-17
(051383)
140
6-16
(051382)
6-15
(051381)

26	Siltstone, sandy, light brown-grey weathering light grey, rubbly, thin-bedded, crossbedded; interbedded with very fine to fine grained, buff weathering, carbonaceous sandstone in beds up to 0.5 m thick; subordinate very silty shale. Unit weathers resistant.
25	Shale, silty, dark grey weathering light grey, blocky, resistant; in beds 0.5 to 0.3 m thick; interbedded with siltstone to very fine grained sandstone light grey-brown weathering light grey; thin-bedded, carbonaceous. Pods and lenses of Buchia coquina throughout.
24	Shale to mudstone, dark grey weathering same, pure to moderately silty, flaky to rubbly weathering with a few more resistant bands.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6-13
(051379)
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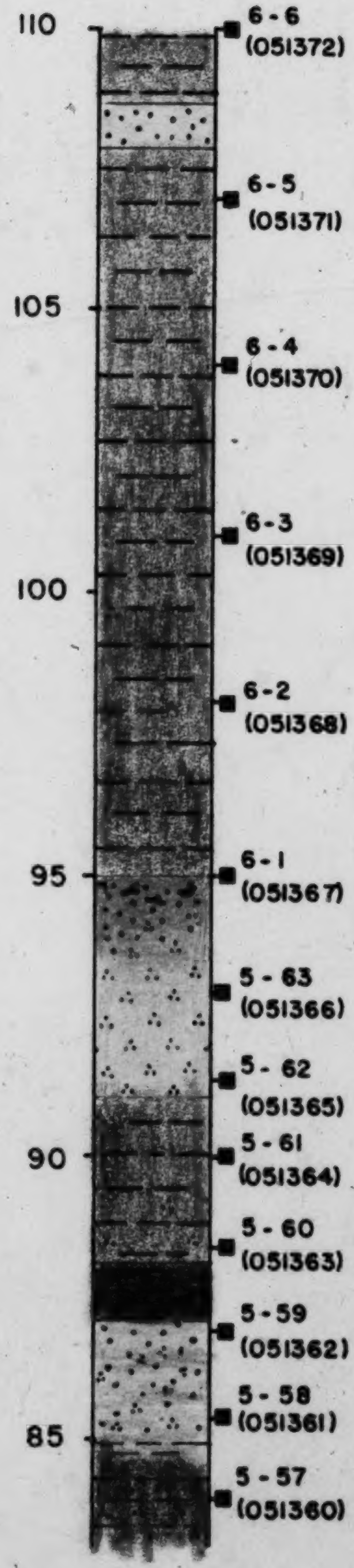
6-12
(051378)
125
6-11
(051377)
6-10
(051376)
120
6-9
(051375)
6-8
(051374)
115
6-7
(051373)
110
6-6
(051372)

24	Shale and/or mudstone, as above
23	Shale, silty, rubbly, reddish-brown.
22	Shale, dark grey weathering light grey with occassional rusty bands, recessive.
21	Siltstone, rubbly weathering.
20	Shale, dark grey weathering same; pure, recessive.
19	Siltstone, greyish-brown, rubbly.
18	Shale dark grey weathering medium grey and rarely rusty; pure, recessive.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100
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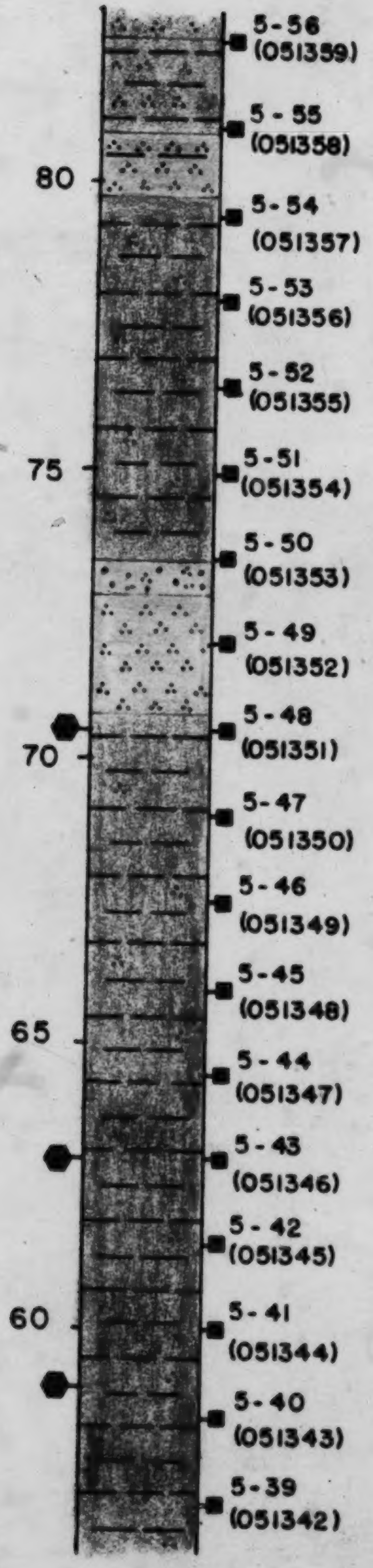
90
85
6-6 (051372)
6-5 (051371)
6-4 (051370)
6-3 (051369)
6-2 (051368)
6-1 (051367)
5-63 (051366)
5-62 (051365)
5-61 (051364)
5-60 (051363)
5-59 (051362)
5-58 (051361)
5-57 (051360)

17	Sandstone, fine grained, greyish-brown, weathering buff-brown with occassional coaly lenses, resistant.
16	Shale, as in Unit 18.
15	Siltstone, dark grey weathering same and buff; rubbly to blocky. Upper 1.0 m consists of ochre weathering, friable, fine grained sandstone with coaly lenses. Forms 4th resistantant band.
14	Shale, dark grey, silty, recessive.
13	Mudstone, very silty, dark grey weathering light grey and rusty, rubbly, resistant; interbedded with sandstone, light grey weathering buff, thin-bedded, commonly cross-bedded and bioturbated; capped by resistant, rusty weathering siltstone. Forms 3rd resistant band.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(051355)
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(051354)
5-50
(051353)
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(051352)
5-48
(051351)
70
5-47
(051350)
5-46
(051349)
5-45
(051348)
65
5-44
(051347)
5-43
(051346)
5-42
(051345)
60
5-41
(051344)
5-40
(051343)
5-39
(051342)

12 Shale, dark grey weathering same and rusty, flaky, recessive.

11

10 Silty shale and siltstone, dark grey weathering orange, rubbly to blocky.

Form 2nd resistant band.

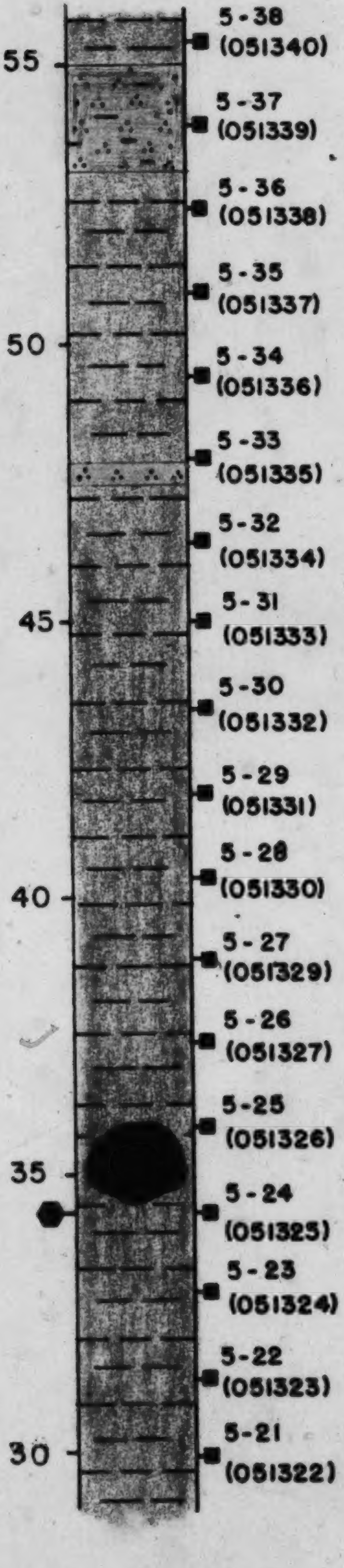
Shale, silty, dark grey, recessive.

Siltstone, sandy, medium grey weathering buff, massive and resistant.

9

8 Siltstone, dark grey weathering light grey, rubbly, resistant. Together with Unit 9 forms 1st resistant band.

7 Shale, dark grey weathering same, pure to slightly silty, platy, recessive.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5-33 (051335)
5-32 (051334)
5-31 (051333)
5-30 (051332)
5-29 (051331)
5-28 (051330)
5-27 (051329)
5-26 (051327)
5-25 (051326)
5-24 (051325)
5-23 (051324)
5-22 (051323)
5-21 (051322)

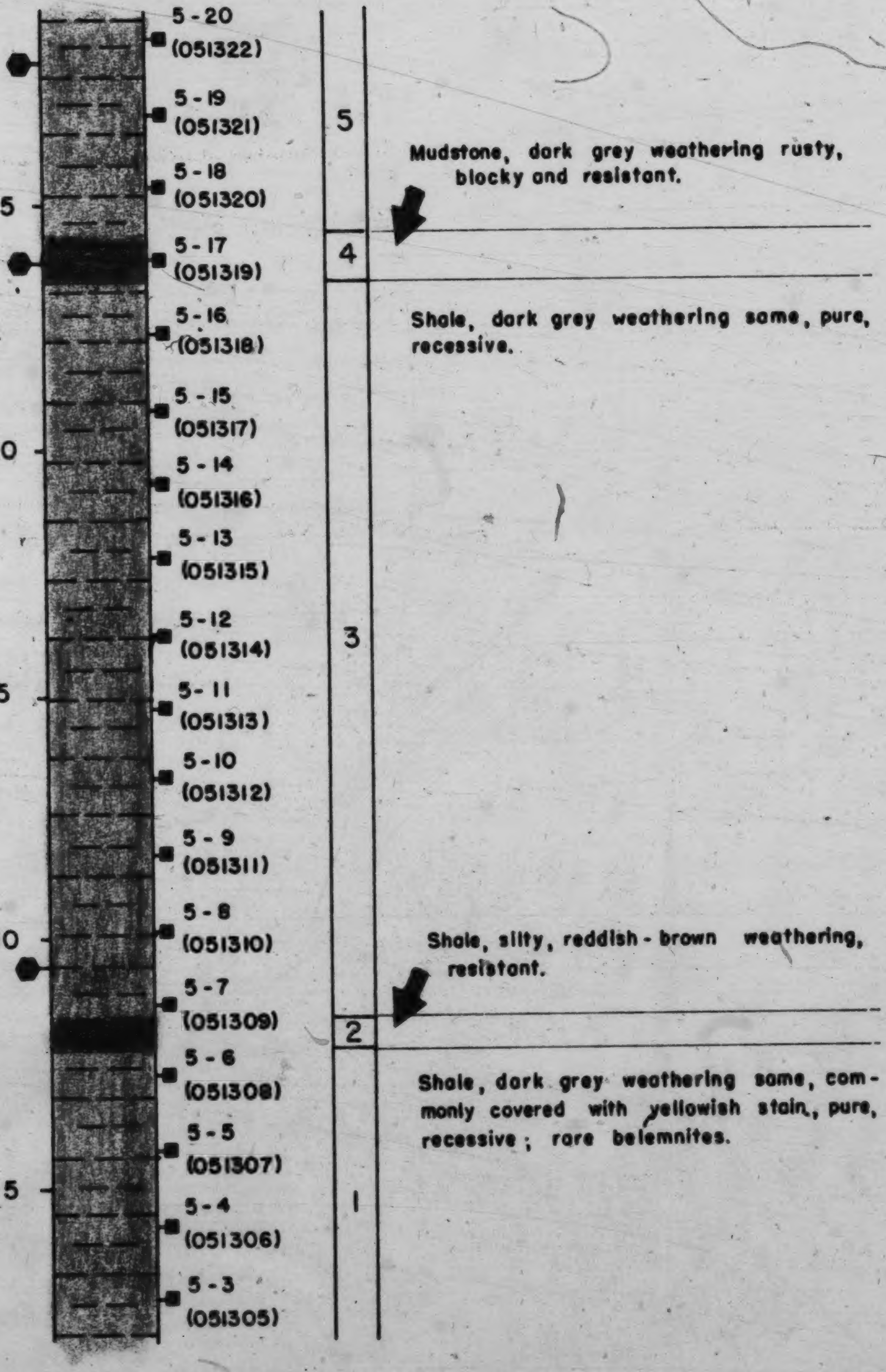
6 **Siltstone**, sandy, yellowish-brown weathering, minor dark grey, silty shale, carries Buchia sp.

5 **Shale**, dark grey weathering some, pure to slightly silty s recessive.

at 47.5 - 48 m have siltstone, dark grey weathering orangy, lenticular, carries Buchia sp.

at c. 40 - 47m shales strongly indurated.

at c. 34.5 - 39 m zone of so-called "mega-concretions"; a discontinuous horizon of yellowish-orange to rusty weathering clay ironstone concretions 2 - 3 m in diameter and 3 - 5 m long.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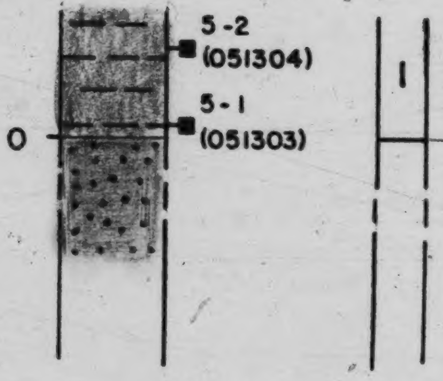
(051310)
10
5 - 7
(051309)
5 - 6
(051308)
5 - 5
(051307)
5
5 - 4
(051306)
5 - 3
(051305)
5
4
3
2
1

Mudstone, dark grey weathering rusty, blocky and resistant.

Shale, dark grey weathering same, pure, recessive.

Shale, silty, reddish - brown weathering, resistant.

Shale, dark grey weathering same, commonly covered with yellowish stain, pure, recessive ; rare belemnites.



BUG CREEK FMT. (UPPER SST. MBR.)

Sandstone, quartzose, tan weathering yellowish-brown, fine grained, medium bedded, massive, very resistant; contact with overlying unit abrupt, sharp: no basal conglomerate or grit seen.

LEGEND

⁘	SANDSTONE
⁖	SILTSTONE
☰	SHALE
▬	CONCRETIONARY HORIZON
⬣	G.S.C. MEGAFOSSIL LOCALITY
■	G.S.C. MICROFOSSIL LOCALITY (Field and Catalogue Nos. shown)

Lithologies are shaded in approximate weathering colors.

APPENDIX B

MACROFOSSIL IDENTIFICATIONS

The following macrofossil identifications are cited from Geological Survey of Canada Internal Report No. Km-3-1977-JAJ, and were made by Dr. J. A. Jeletzky.

GSC Location No. 050886

Height above Base: 12.5 metres.

Fauna: Buchia (Anaucella) concentrica (Sow.) early form
Camptonectes (Boreionectes) cf. praecinctus Spath
Camptonectes (s. lato) sp. indet.

Age: late Oxfordian.

GSC Location No. 050887

Height above Base: 15.5 metres.

Fauna: Phylloceratid ammonite, genus and species indet.
Pleuromya sp. indet.
Camptonectes (Boreionectes) sp. indet.
Gastropods, genus and species indet.
Dentalium (s. lato) sp. indet.

Age: late Jurassic to Valanginian (no diagnostic fauna)

GSC Location No. 050888

Height above Base: 23.2 - 24.3 metres.

Fauna: Buchia (Anaucella) concentrica (Sow.) s. lato
Camptonectes (Boreionectes) cf. praecinctus Spath

Age: Oxfordian (?early)

GSC Location No. 050889

Height above Base: 31.5 - 35.0 metres.

Fauna: *Buchia* aff. *B.* (*Anaucella*) *concentrica* (Sow.)
Buchia cf. *mosquensis* (v. Buch) s. lato
Cylindroteuthis (*Cylindroteuthis*) sp. indet.
"*Turbo*" ex. aff. *T.* *ferniensis* Frebold

Age: late Oxfordian to early Kimmeridgian.

GSC Location No. 050890

Height above Base: 59.5 metres.

Fauna: *Buchia* (*Anaucella*) *concentrica* (Sow.) s. lato
indeterminate pelecypods

Age: late Oxfordian.

GSC Location No. 050891

Height above Base: 72.5 metres.

Fauna: *Buchia* (*Anaucella*) *concentrica* (Sow.) s. lato

Age: late Oxfordian.

GSC Location No. 050909

Height above Base: 152.5 metres.

Fauna: *Buchia* (*Anaucella*) *concentrica* (Sow.) s. lato

Age: late Oxfordian.

GSC Location No. 050910

Height above Base: 155.0 metres.

Fauna: *Buchia* (*Anaucella*) *concentrica* (Sow.) s. lato
indeterminate pelecypods

Age: late Oxfordian.

GSC Location No. 050912

Height above Base: 159.0 metres.

Fauna: Buchia (Anaucella) concentrica (Sow.) s. lato and var.
erringtoni (Gabb)
Buchia cf. mosquensis (v. Buch)

Age: early Kimmeridgian.

GSC Location No. 050913

Height above Base: 161.0 metres.

Fauna: Buchia piochii (Gabb) s. lato
Buchia cf. blandfordiana (Stoliczka)
indeterminate pelecypods

Age: mid to late Portlandian.

GSC Location No. 050915

Height above Base: 169.5 metres.

Fauna: Buchia cf. fischeriana (d'Orbigny) s. lato
Buchia cf. piochii (Gabb) s. lato
"Aucellina" ex. aff. "A." schmidti Sokolov 1912
indeterminate pelecypods

Age: mid to late Portlandian or Upper Tithonian (unlikely).

GSC Location No. 050917

Height above Base: 174.5 metres.

Fauna: Buchia cf. fischeriana (d'Orbigny) s. lato
Buchia cf. piochii (Gabb) s. lato
"Aucellina" (actually Meleagrinella) n. sp. ex. aff.
"A." schmidti Sokolov 1912

Age: mid to late Portlandian or Upper Tithonian (unlikely).

PLATE 1

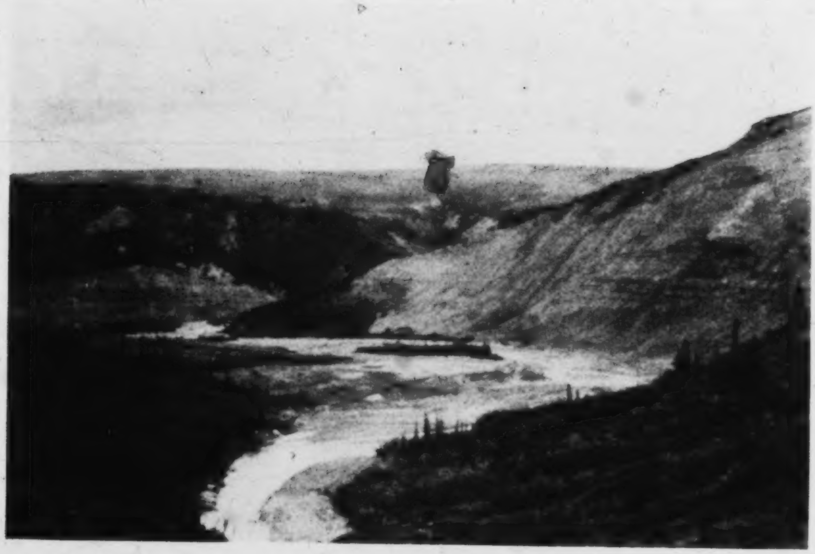


FIGURE 1a. Martin Creek, Aklavik Range, N. W. T. , view looking northeast (downstream). The upper two thirds of the sampled section of the Husky Formation is exposed in the large cutbank at the right.

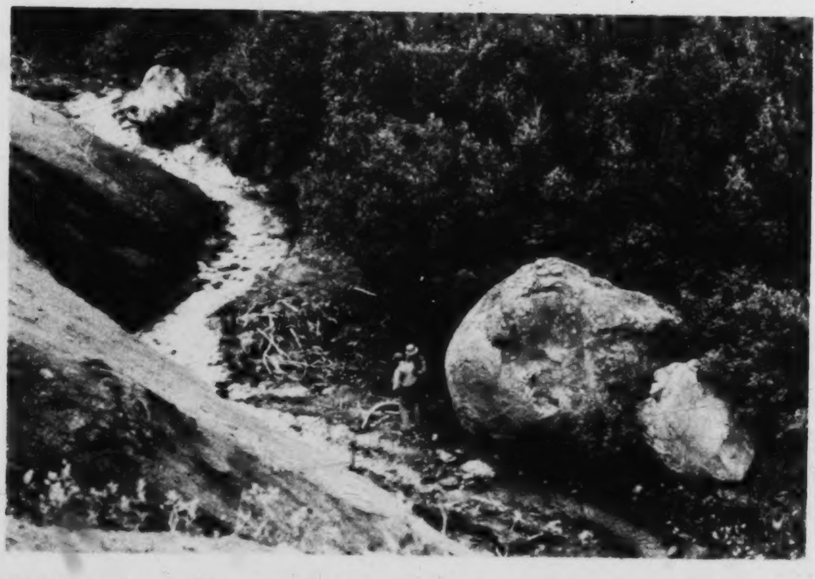


FIGURE 1b. "Mega-concretions" which occur about 36 m above the base of the Husky Formation at the Martin Creek locality. Two geologists give the scale. This particular concretion is not in place.

PLATE 2

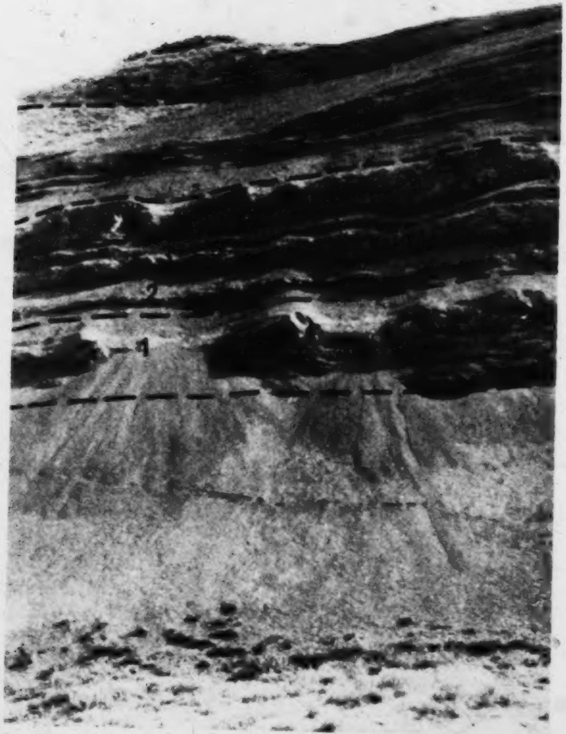


FIGURE 2a. View of Lower Member from base of large cutbank shown in Fig. 1a of Plate 1. The four "silty horizons" (actually coarsening upward sequences) occuring 70.5 to 95 m above the base of the section are labelled 1 to 4. The unit labelled "5" is the 17 m thick sandstone-siltstone originally assumed to be the Arenaceous Member, but now regarded as Porcupine River Formation equivalent.

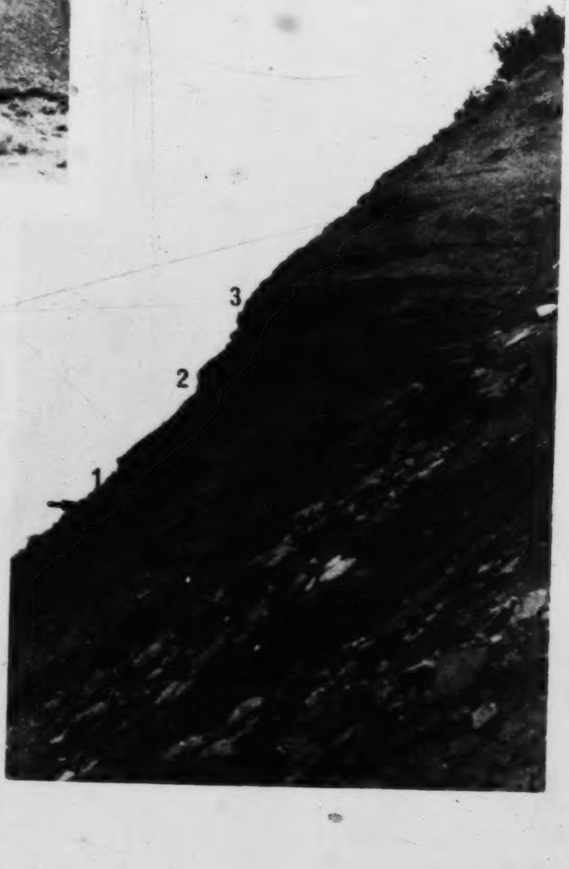


FIGURE 2b. Outcrop of Lower Member of Husky Formation on small confluent of Martin Creek, where sections 75-5-5 and 75-5-6 were measured. The basal three "silty horizons" (numbers 1 to 3 of Fig. 2a) are shown in profile view. Arrow at left indicates geologist for scale.

EXPLANATION OF PLATES 3 to 38

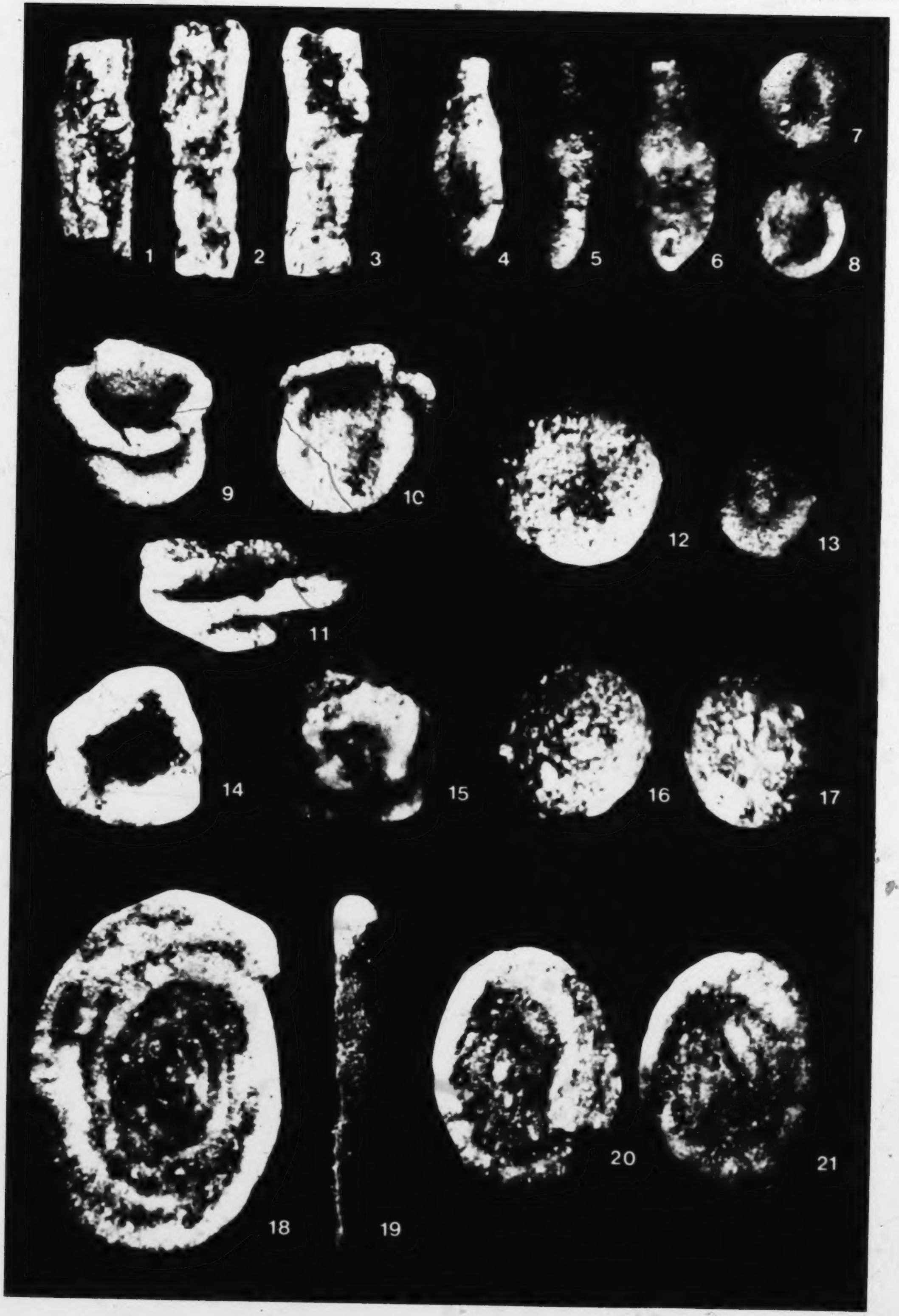
To facilitate comparisons of various species, the plates are arranged such that foraminifers comprising the "Plus 80 Mesh" and the "Minus 80 Mesh" Fractions are illustrated at the same respective magnifications. Thus foraminifers belonging to the former group are illustrated at a magnification of approximately 40x, while foraminifers comprising the latter group are illustrated at a magnification of approximately 120x.

EXPLANATION OF PLATE 3

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-3	*Bathysiphon* sp.	69
	1 Figured specimen A (GSC 57083); side view. 2, 3 Figured specimen B (GSC 57084); opposite side views.	
4-6	*Hippocrepina*(?) sp. *7-7*	71
	4-6 Figured specimen A (GSC 57086); opposite side and peripheral views.	
7-11, 14, 15	*Saccammina* sp. cf. *S. lathrami* Tappan	72
	7, 8 Figured specimen B (GSC 57088); opposite side views of a small, well preserved specimen. 9, 10 Figured specimen A (GSC 57087); opposite side views of a ruptured specimen. 11 Figured specimen C (GSC 57089); top view of a ruptured specimen. 14, 15 Figured specimen D (GSC 57090); top and bottom views of a ruptured specimen.	
12, 13	*Saccammina* sp. *5-6*	73
	12 Figured specimen A (GSC 57091); side view. 13 Figured specimen C (GSC 57093); side view.	
16, 17	*Saccammina* sp. *7-10*	74
	16, 17 Figured specimen A (GSC 57094); side and peripheral views.	
18-21	*Ammodiscus* sp. cf. *A. cheradospirus* Loeblich and Tappan .	78
	18, 19 Figured specimen C (GSC 59109); side and peripheral views of adult specimen. 20, 21 Figured specimen B (GSC 59108); opposite side views.	

PLATE 3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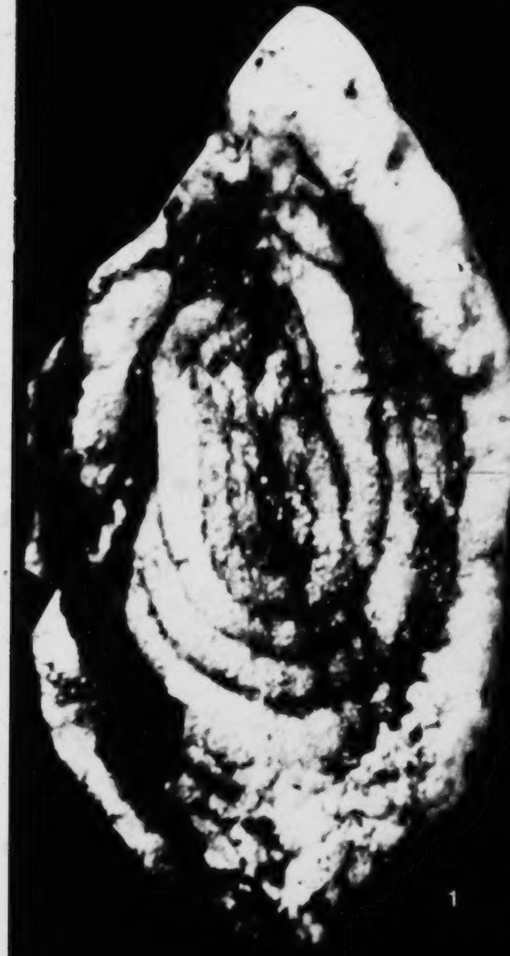
EXPLANATION OF PLATE 4

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-5	Ammodiscus sp. cf. A. silicea Terquem	84
	1, 2 Figured specimen A (GSC 57122); opposite side views of a slightly crushed specimen.	
	3, 4 Figured specimen F (GSC 57127); opposite side views of juvenile specimen.	
	5 Figured specimen D (GSC 57125); side view of a fragmentary, undeformed specimen.	

PLATE 4



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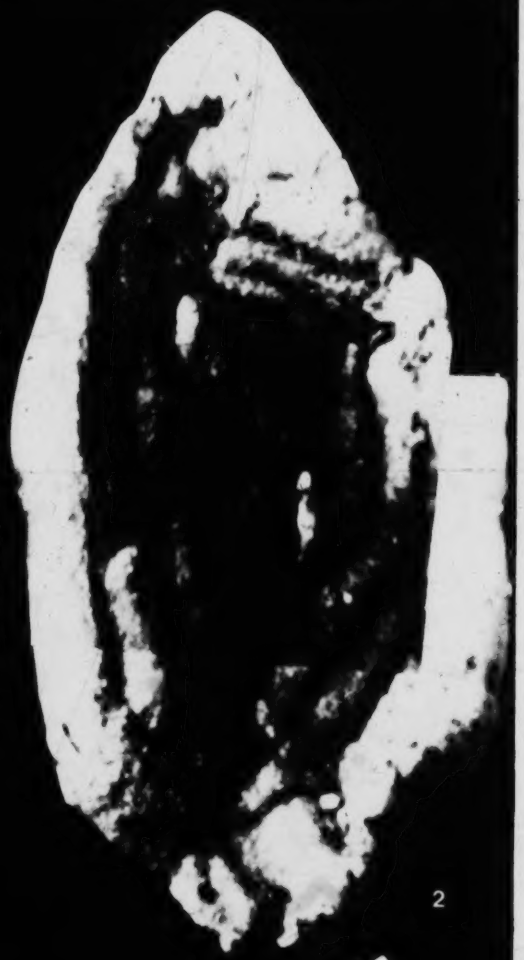

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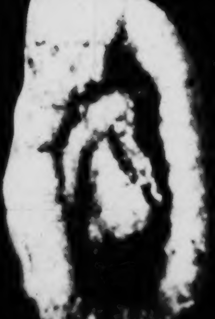

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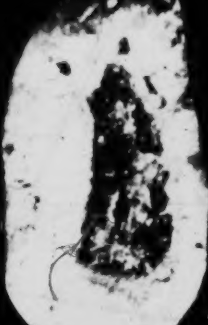

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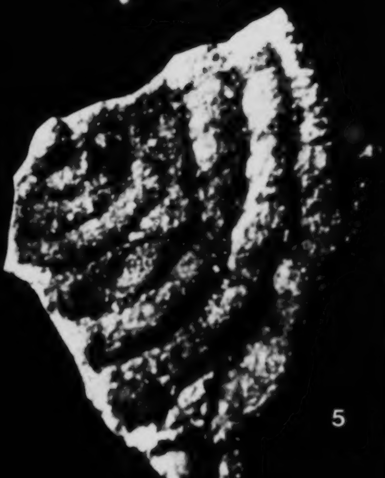

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EXPLANATION OF PLATE 5

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure — Page

1-6 *Ammodiscus* sp. cf. *A*. *silicea* Terquem 84

1-3 Figured specimen E (GSC 57126); opposite side and peripheral views.

4-6 Figured specimen B (GSC 57123); opposite side and peripheral views.

7-10 *Ammodiscus* sp. cf. *A*. *cheradospirus* Loeblich and Tappan var. *A* 80

7 Figured specimen C (GSC 57114); side view of unusually large specimen.

8, 9 Figured specimen B (GSC 57113); opposite side views.

10 Figured specimen A (GSC 57112); side view. Note the coarse-grained nature of the test wall.

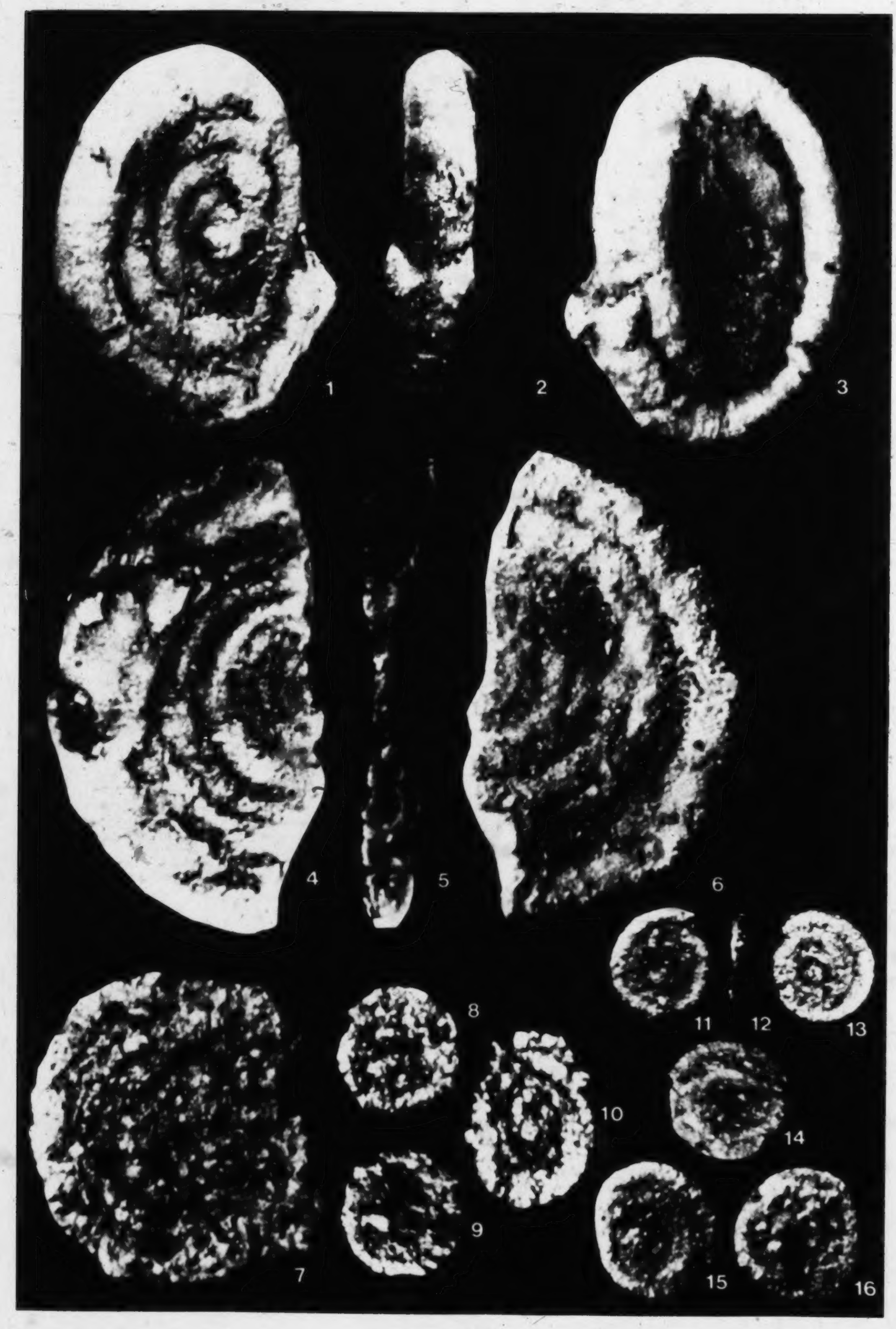
11-16 *Ammodiscus* *orbis* Lalicker 75

11-13 Hypotype A (GSC 57095); opposite side and peripheral views of adult specimen.

14 Hypotype C (GSC 57097); side view.

15, 16 Hypotype B (GSC 57096); opposite side views.

PLATE 5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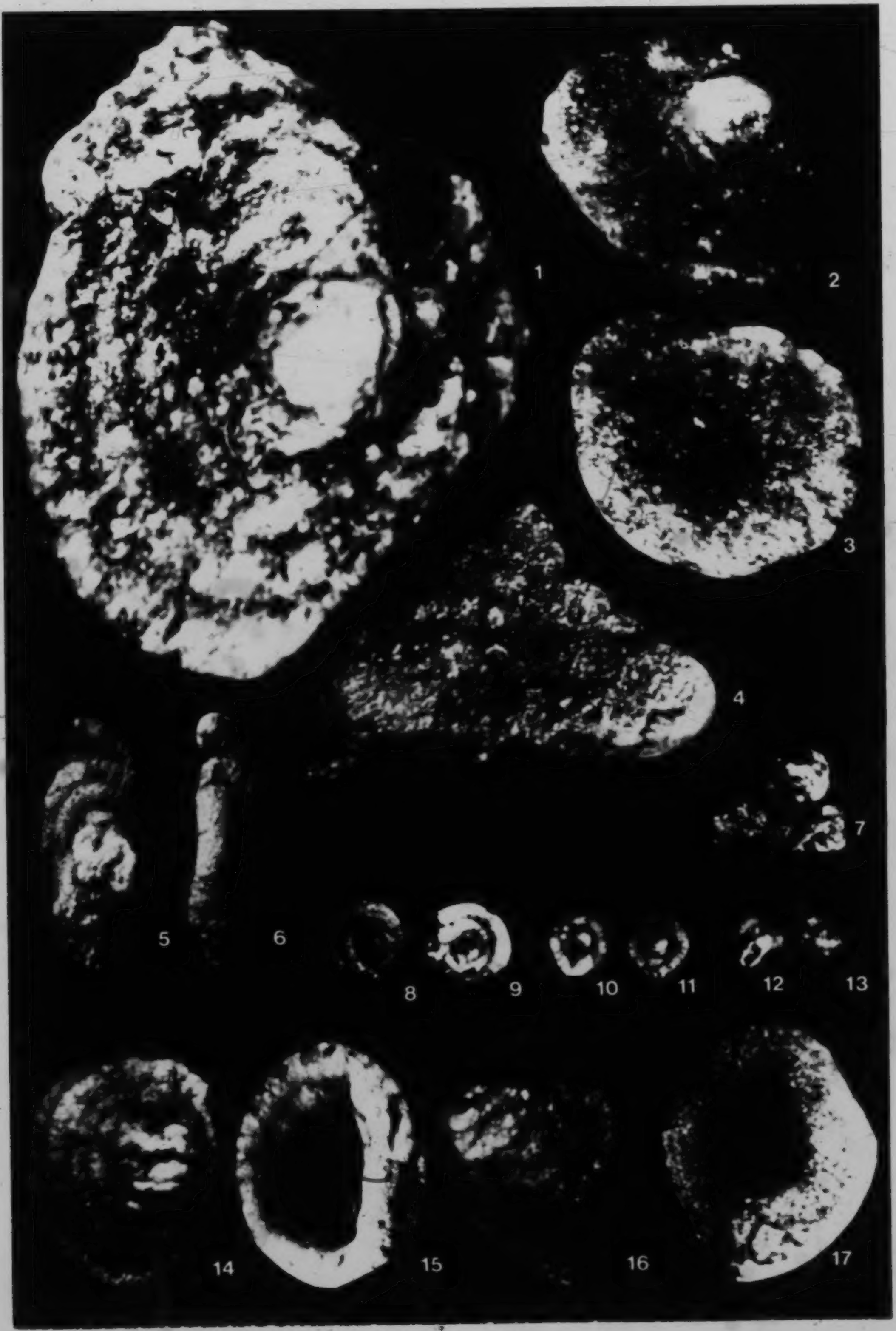
EXPLANATION OF PLATE 6

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1	*"Arenoturrispirillina"* sp. cf. *A. waltoni* Chamney . . . Figured specimen A (GSC 57132); top view.	87
2-4 16, 17	*Arenoturrispirillina* sp. cf. *A. intermedia* Chamney . . 2, 3 Figured specimen A (GSC 57128); dorsal and ventral views. 4 Figured specimen C (GSC 57130); side view of strongly crushed specimen. 16, 17 Figured specimen B (GSC 57129); dorsal and ventral views.	86
5, 6 14, 15	*"Arenoturrispirillina"* sp. *7-22* . . . . 5, 6 Figured specimen B (GSC 57134); dorsal and side views of slightly crushed specimen. 14, 15 Figured specimen A (GSC 57133); dorsal and ventral views.	89
8-13	*Glomospira*(?) sp. *7-22* . . . . 8, 9 Figured specimen D (GSC 57154); opposite side views. 10, 11 Figured specimen A (GSC 57151); opposite side views. 12, 13 Figured specimen B (GSC 57152); opposite side views.	94
7	*Lituotuba*(?) sp. *7-18* . . . . 7 Figured specimen A (GSC 58503); side view.	

PLATE 6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EXPLANATION OF PLATE 7

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

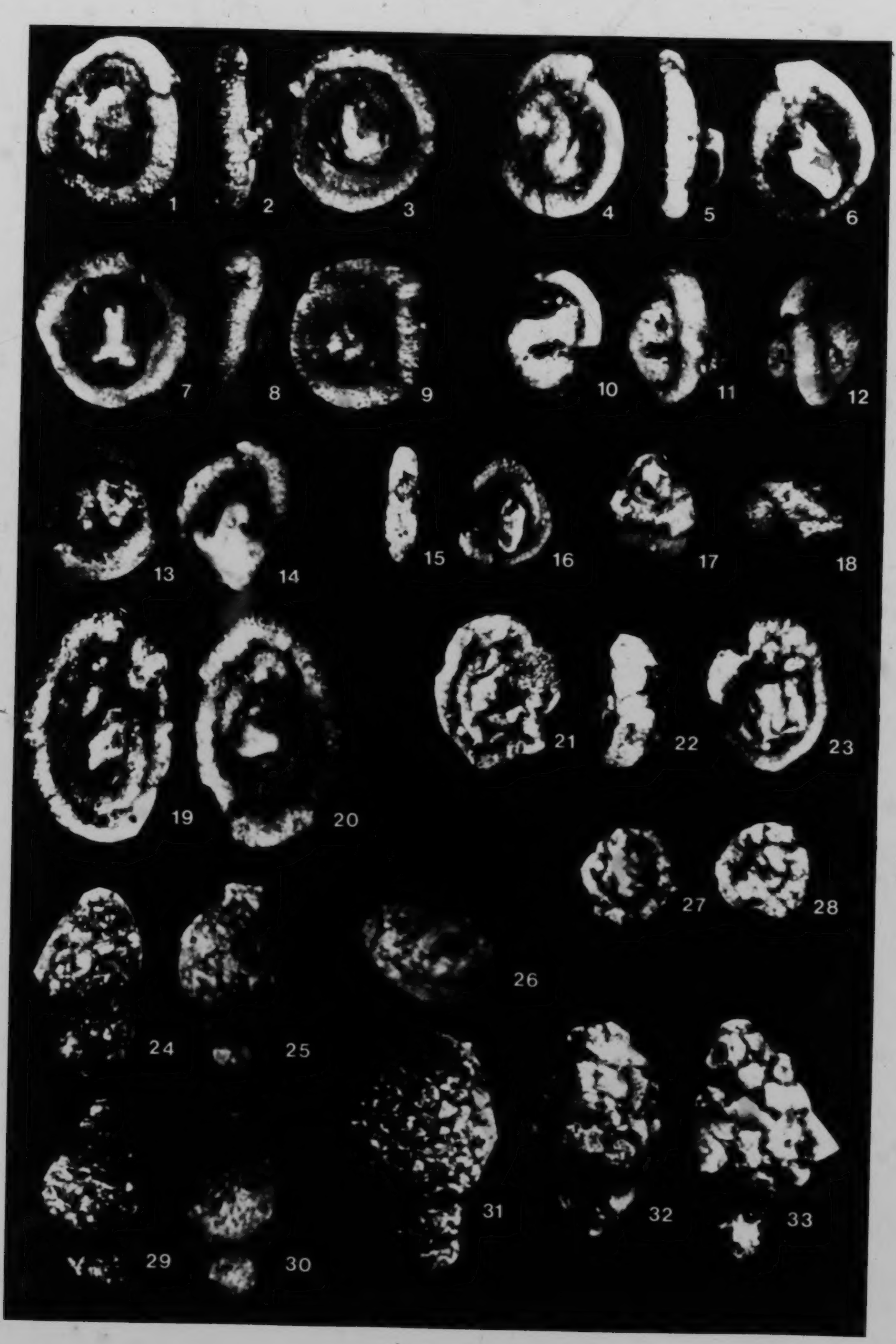
Figure		Page
1-18	*"Tolypammina"* sp. *6-11*	98
	1-3 Figured specimen A (GSC 57162); opposite side and peripheral views of a typical adult specimen. 4-6 Figured specimen H (GSC 58504); opposite side and peripheral views. 7-9 Figured specimen B (GSC 57163); opposite side and peripheral views. 10-12 Figured specimen I (GSC 58505); side and peripheral views of a juvenile specimen. Note that in this case the surface of attachment is a small *Cribrostomoides* test. 13, 14 Figured specimen F (GSC 57167); opposite side views of an immature specimen. 15, 16 Figured specimen D (GSC 57165); peripheral and side views of an immature specimen. 17, 18 Figured specimen G (GSC 57168); side and peripheral views of a juvenile specimen, showing nature of initial attachment to substrate grain.
19-23 27, 28	*"Tolypammina"* sp. *7-18*	99
	19, 20 Figured specimen A (GSC 57169); opposite side views. 21-23 Figured specimen D (GSC 57172); opposite side and peripheral views. 27, 28 Figured specimen E (GSC 57173); opposite side views of a juvenile specimen.
24-26, 29-31	*Reophax metensis* Franke	104
	24, 25 Hypotype B (GSC 57185); side and peripheral views. 29, 30 Hypotype C (GSC 57186); side and peripheral views. 26, 31 Hypotype A (GSC 57184); top (apertural) and side views.

EXPLANATION OF PLATE 7 (cont'd)

Figure		Page
32, 33	Reophax sp. cf. R. adaptatus Dain	106

32, 33 Figured specimen G (GSC 57196); opposite side views of a small (?juvenile) specimen.

PLATE 7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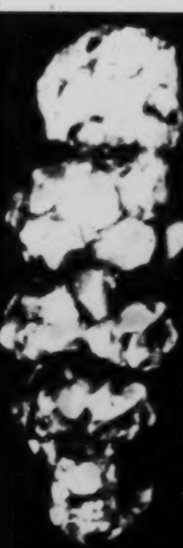
EXPLANATION OF PLATE 8

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-5	*Reophax* sp. cf. *R*. *densa* Tappan	110
	1-3 Figured specimen B (GSC 57211); opposite side and peripheral views of adult specimen.	
	4, 5 Figured specimen A (GSC 57210); opposite side views.	
6-9	*Reophax* sp. *5-10*	107
	6, 7 Figured specimen A (GSC 57197); opposite side views.	
	8 Figured specimen B (GSC 57198); side view.	
	9 Figured specimen D (GSC 57200); side view.	
10-12	*Reophax* sp. cf. *R*. *adaptatus* Dain	106
	10, 11 Figured specimen A (GSC 57190); opposite side views of slightly crushed specimen.	
	12 Figured specimen B (GSC 57191); side view.	

PLATE 8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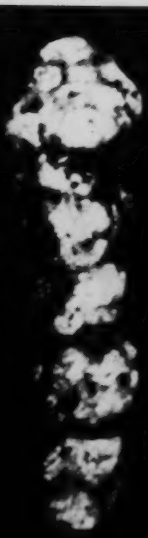
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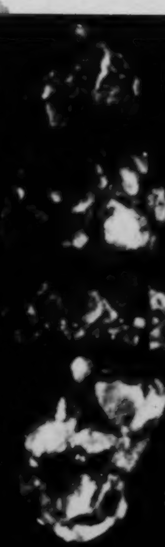
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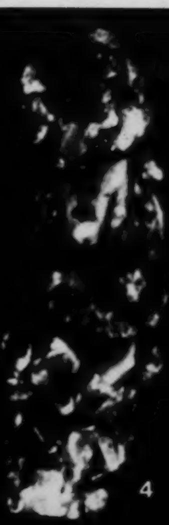
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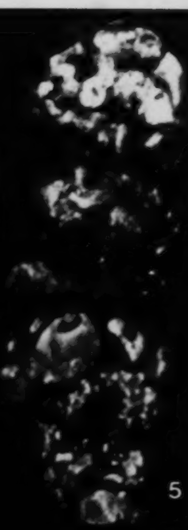
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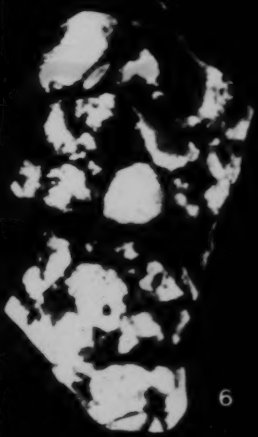
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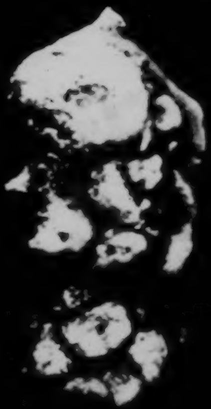
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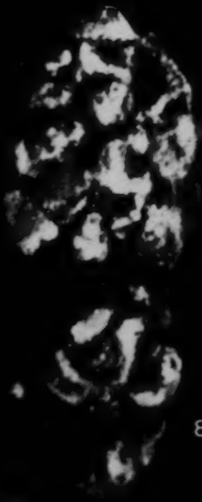
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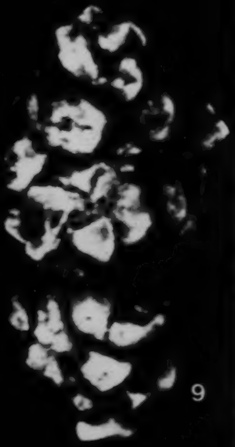
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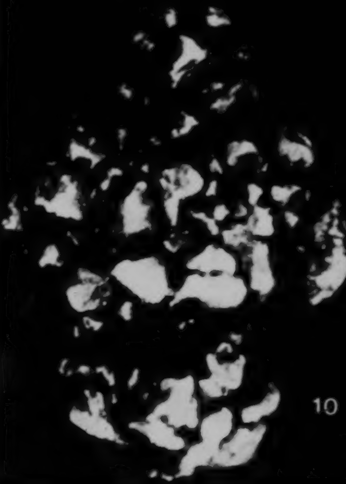
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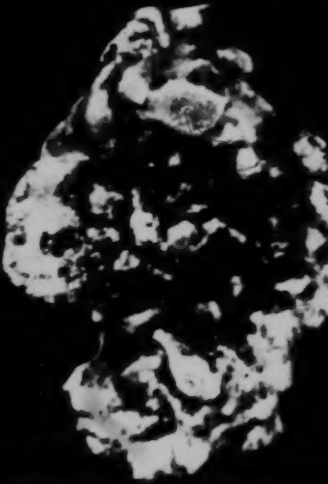
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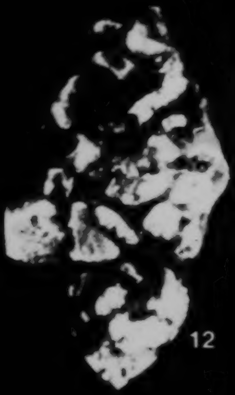
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EXPLANATION OF PLATE 9

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-14	Cribrostomoides goodenoughensis (Chamney)	122

1-3 Hypotype A (GSC 57241); opposite side and apertural views of adult specimen. Note the ring of "septal nodes" around the umbilical depression.

4-6 Hypotype F (GSC 57246); opposite side and apertural views of a small adult specimen.

7-9 Hypotype B (GSC 57242); opposite side and apertural views.

10, 11 Hypotype E (GSC 57245); side and apertural views.

12 Hypotype D (GSC 57244); S.E.M. photomicrograph of an enlarged portion of Figure 14 (chambers 4-7) showing the nature and position of the aperture on four successive septa. Note that the aperture is clearly areal, ovate in outline, and possesses a distinct bordering lip; 175x.

13 Hypotype D (GSC 57244); external view.

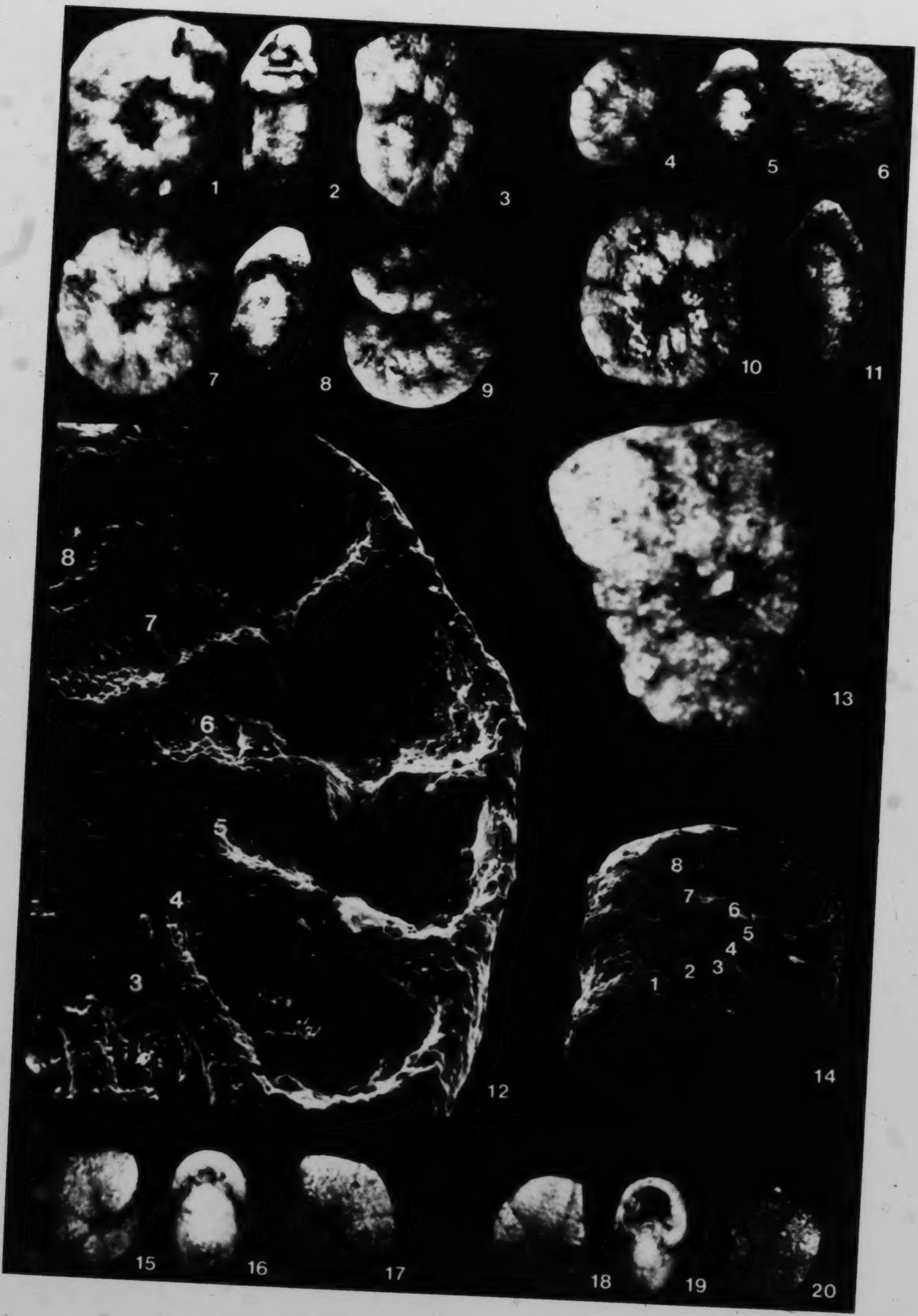
14 Hypotype D (GSC 57244); oblique view of cut away portion of specimen. The chambers are numbered in increasing order from the ultimate chamber; S.E.M. photomicrograph, 80x.

Figure		Page
15-20	Cribrostomoides sp. cf. C. mirandus Dain	125

15-17 Figured specimen A (GSC 57248); opposite side and apertural views of adult specimen.

18-20 Figured specimen B (GSC 57249); opposite side and apertural views. The ultimate chamber is broken.

PLATE 9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EXPLANATION OF PLATE 10

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure — Page

1, 2 *Cribrostomoides goodenoughensis* (Chamney) 122

1 Hypotype C (GSC 57243); view of partially thin-sectioned specimen. The chambers are infilled with pyrite. Note that the apertures - represented by a break in the septal wall - are clearly raised above the bases of the septa; S.E.M. photomicrograph, 80x.

2 Hypotype C (GSC 57243); external view; 80x.

3-14 *Cribrostomoides canui* (Cushman) 120

3-5 Hypotype B (GSC 57236); opposite side and apertural views of a large, robust specimen.

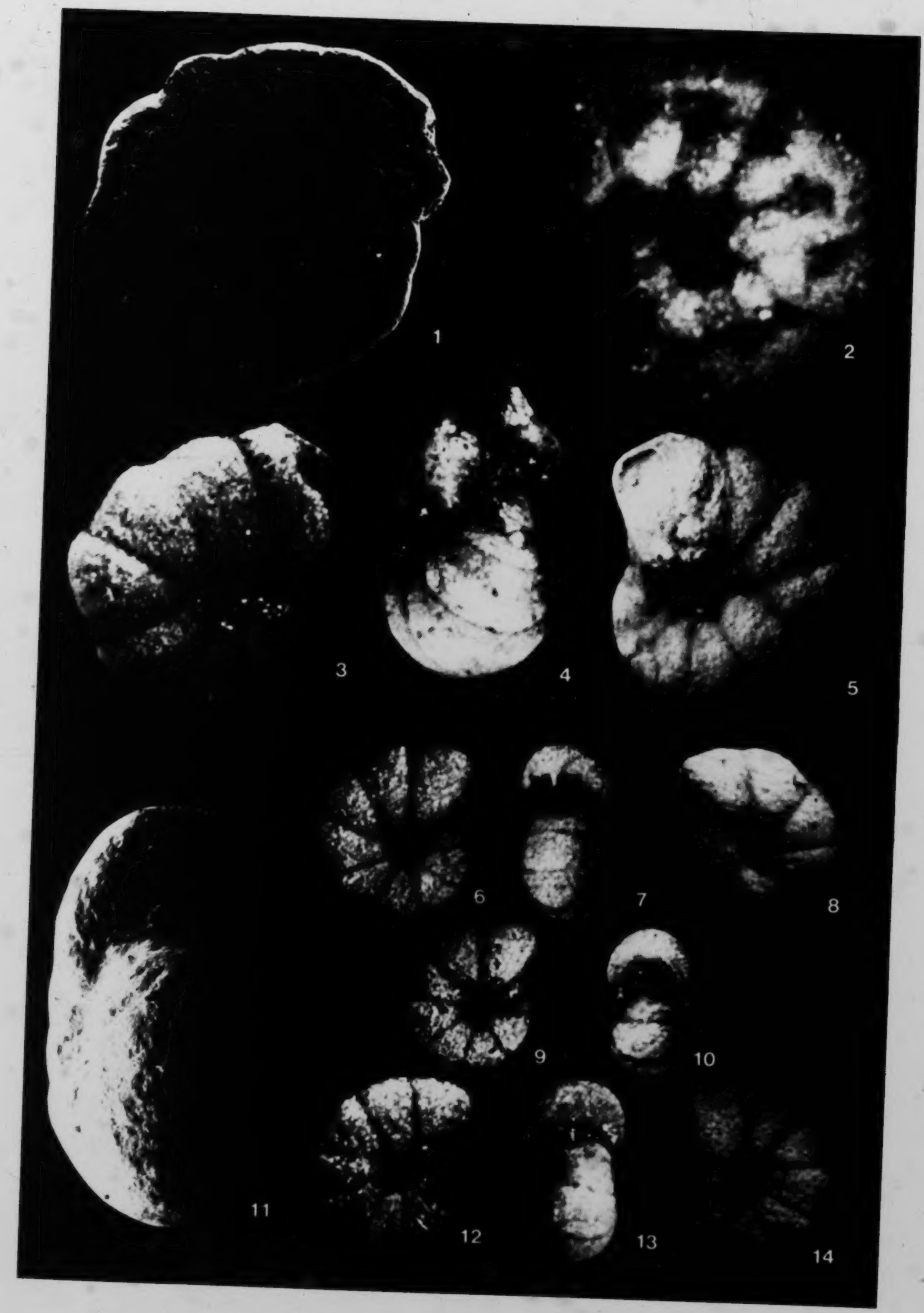
6 Hypotype F (GSC 57240); apertural view showing areal, lipped aperture; S.E.M. photomicrograph, 80x.

7-9 Hypotype A (GSC 57235); opposite side and apertural views of typical adult specimen.

10, 11 Hypotype D (GSC 57238); side and apertural view.

12-14 Hypotype C (GSC 57237); opposite side and apertural views of adult specimen.

PLATE 10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EXPLANATION OF PLATE 11

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure Page

1-3 *Cribrostomoides canui* (Cushman) 120

1 Hypotype E (GSC 57239); side view of unusually large individual.

2, 3 Hypotype G (GSC 57367); apertural and side views of an evolute variant.

4-12 *Evolutinella* sp. *5-25* 127

4-6 Figured specimen B (GSC 57255); opposite side and apertural views of adult specimen.

7-9 Figured specimen C (GSC 57256); opposite side and apertural views.

10-12 Figured specimen A (GSC 57254); opposite side and apertural views.

13-26 *Recurvoides canningensis* (Tappan) 130

13-15 Hypotype A (GSC 57267); dorsal, side, and ventral views of typical adult specimen.

16-18 Hypotype C (GSC 57269); dorsal, side and ventral views.

19, 20 Hypotype B (GSC 57268); dorsal and ventral views.

21-23 Hypotype F (GSC 57272); dorsal, side and ventral views.

24-26 Hypotype D (GSC 57270); dorsal, side and ventral views of large, coarse-grained variant.

27-39 *Recurvoides disputabilis* Dain 135

27-29 Hypotype A (GSC 57287); opposite side and apertural views of slightly damaged adult specimen.

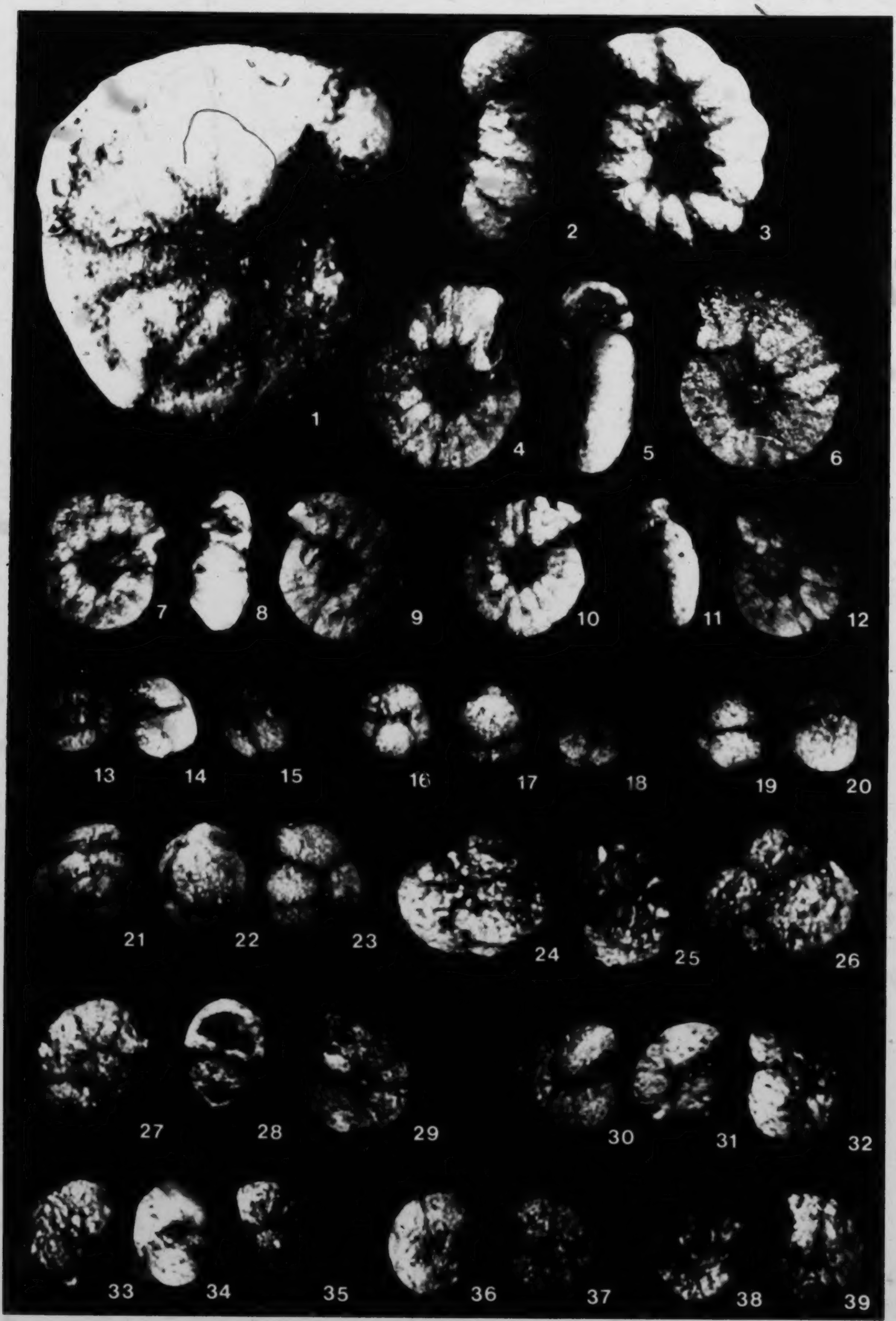
30-32 Hypotype D (GSC 57290); opposite side and apertural views.

33-35 Hypotype G (GSC 57293); opposite side and apertural views.

36, 37 Hypotype E (GSC 57291); opposite side views.

38, 39 Hypotype F (GSC 57292); opposite side views.

PLATE 11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EXPLANATION OF PLATE 12

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-10	*Recurvoides* sp. cf. *R.* *scherkalyensis* Levina	137
	1-3 Figured specimen B (GSC 57295); opposite side and apertural views.	
	4-6 Figured specimen C (GSC 57296); opposite side and apertural views.	
	7, 8 Figured specimen A (GSC 57294); opposite side views.	
	9, 10 Figured specimen D (GSC 57297); opposite side views.	
11-14, 21	*Recurvoides* sp. cf. *R.* *sublustris* Dain	133
	11, 12 Figured specimen D (GSC 57280); apertural and side views.	
	13, 14 Figured specimen C (GSC 57279); opposite side views.	
	21 Figured specimen A (GSC 57277); side view of a large, slightly damaged form.	
15-20	*Recurvoides* *sublustris* Dain	132
	15-17 Hypotype C (GSC 57275); opposite side and apertural views of adult specimen. Note the areal nature of the aperture.	
	18-20 Hypotype B (GSC 57274); opposite side and apertural views. Specimen has broken ultimate, penultimate and antepenultimate chambers.	
22-33	*Recurvoides* sp. *5-10-B*	142
	22-24 Figured specimen A (GSC 57313); opposite side and apertural views.	
	25-27 Figured specimen D (GSC 57316); opposite side and apertural views.	
	28-30 Figured specimen C (GSC 57315); opposite side and apertural views.	
	31-33 Figured specimen B (GSC 57314); opposite side and apertural views.	

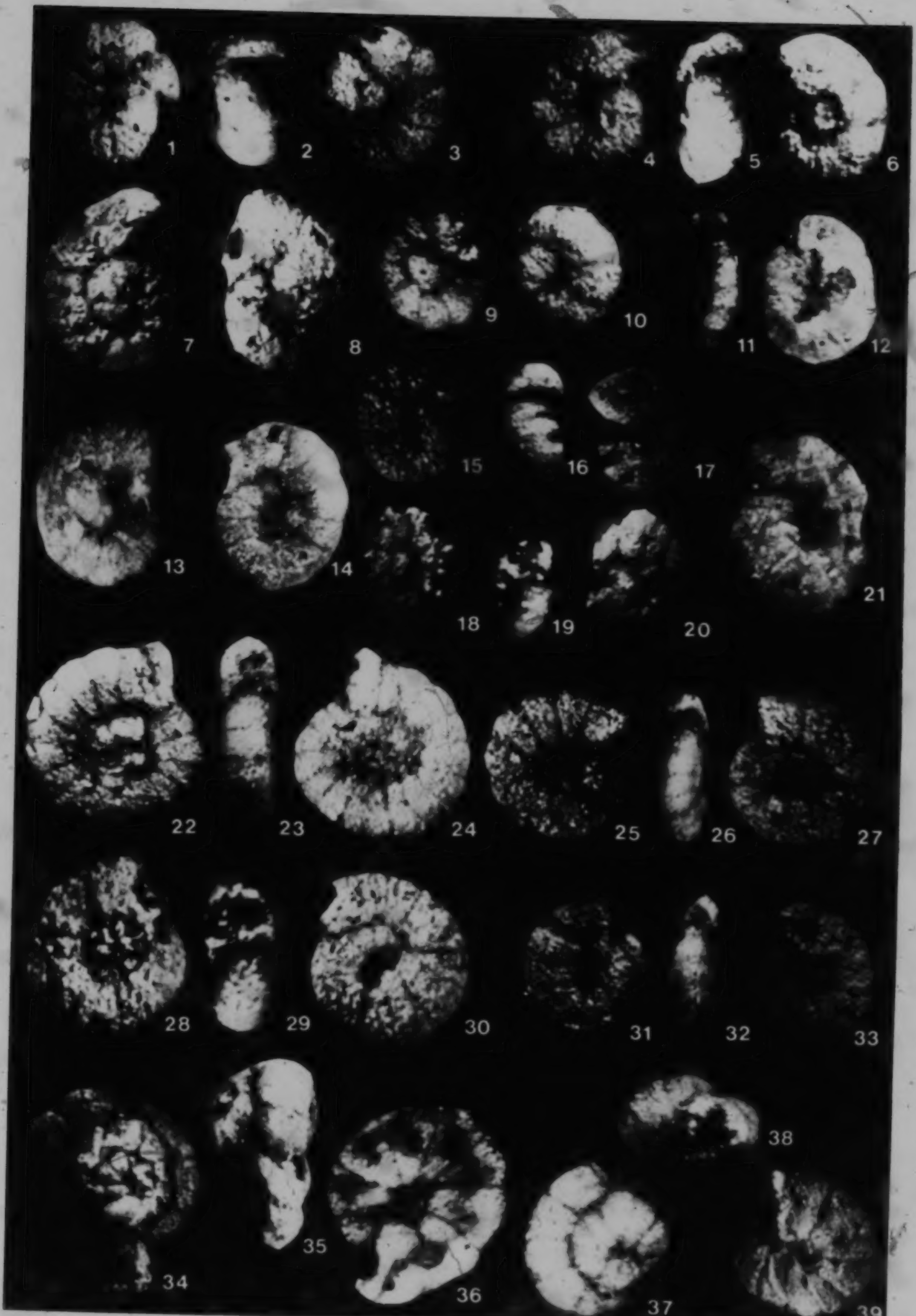
EXPLANATION OF PLATE 12 (cont'd)

Figure		Page
34-39	Recurvoides sp. 5-4	139

34-36 Figured specimen A (GSC 57300); dorsal, side and ventral views of large, slightly crushed specimen. Note the "pseudo-trochoid" nature of the coiling which gives this species a strong resemblance to the genus Trochammina.

37-39 Figured specimen D (GSC 57303); dorsal, side and ventral views.

PLATE 12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EXPLANATION OF PLATE 13

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure Page

1-6 Recurvoides sp. 5-4 139

1-3 Figured specimen B (GSC 57301); dorsal, side and ventral views.

4-6 Figured specimen C (GSC 57302); dorsal, side and ventral views.

7-13, 20 Recurvoides sp. 5-10-A 141

7-9 Figured specimen A (GSC 57307); "dorsal", side and "ventral" views of typical adult specimen.

10,11 Figured specimen D (GSC 57310); "dorsal" and "ventral" views.

12, 13, 20 Figured specimen B (GSC 57308); "dorsal", "ventral" and "cross-sectional" views. Note the rounded triangular outline of the test in the latter view.

14-19, 21-23 Recurvoides sp. 7-23 146

14-16 Figured specimen A (GSC 57328); "ventral", side and "dorsal" views of a typical adult specimen.

17-19 Figured specimen C (GSC 57330); "dorsal", side and "ventral" views.

21-23 Figured specimen B (GSC 57329); "ventral", side and "dorsal" views.

24-35 Trochammina sp. cf. T. rostovzevi Levina 199

24-26 Figured specimen A (GSC 58010); dorsal, side and ventral views of dextrally coiled specimen.

27-29 Figured specimen D (GSC 58013); dorsal, side and ventral views of dextrally coiled specimen.

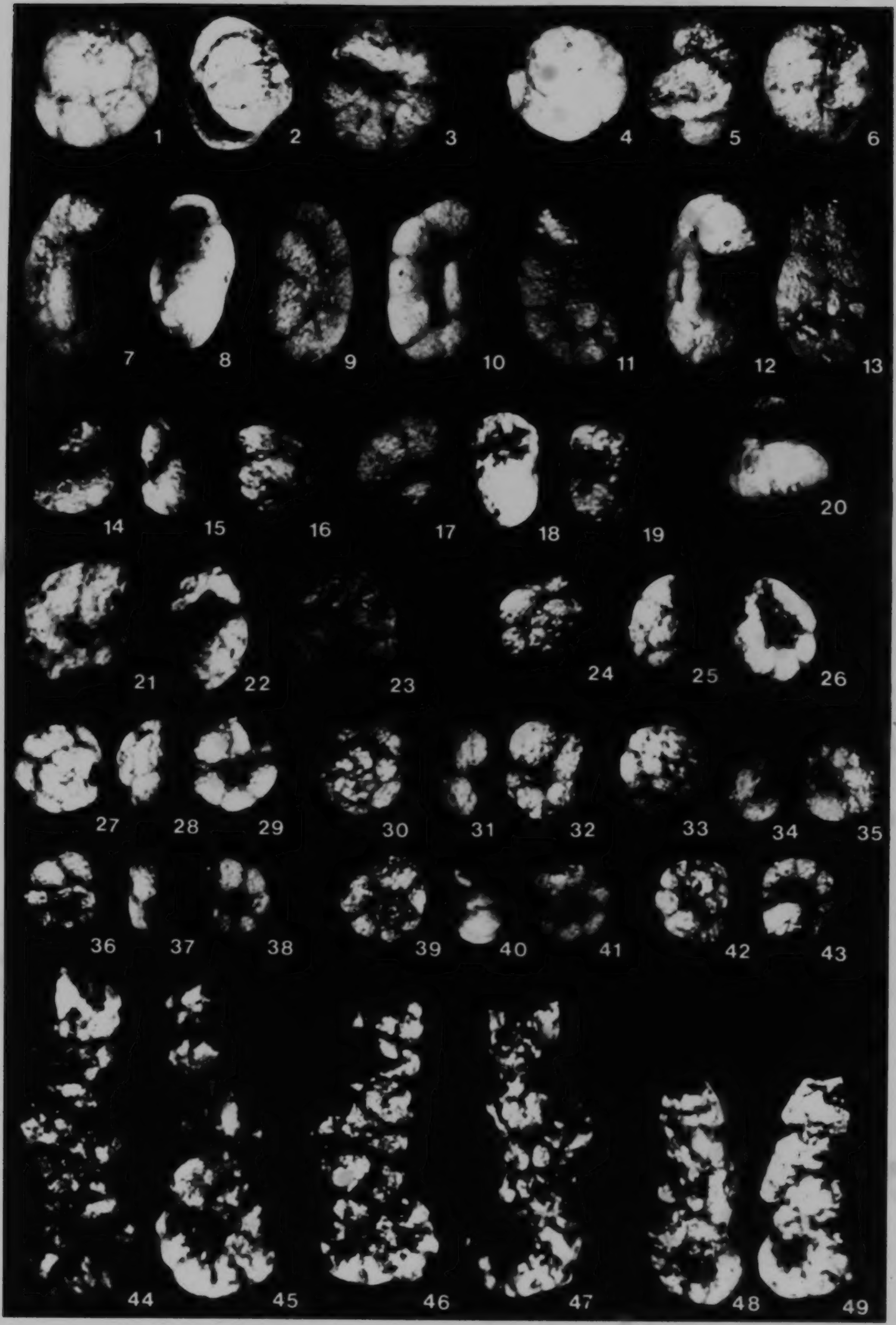
30-32 Figured specimen E (GSC 58014); dorsal, side and ventral views of dextrally coiled specimen.

33-35 Figured specimen C (GSC 58012); dorsal, side and ventral views of sinistrally coiled specimen.

EXPLANATION OF PLATE 13 (cont'd)

Figure		Page
36-43	Trochammina kosyrevae Levina	193
	36-38 Hypotype A (GSC 57492); dorsal, side and ventral views of a dextrally coiled specimen.	
	39-41 Hypotype B (GSC 57493); dorsal, side and ventral views of a dextrally coiled specimen.	
	42, 43 Hypotype F (GSC 57497); dorsal and ventral views of a sinistrally coiled specimen.	
44-49	Ammobaculoides sp. 7-18	179
	44, 45 Figured specimen D (GSC 57447); opposite side views; 80x.	
	46, 47 Figured specimen F (GSC 57449); opposite side views; 80x.	
	48, 49 Figured specimen A (GSC 57444); opposite side views; 80x.	

PLATE 13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EXPLANATION OF PLATE 14

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure   Page

1-6, 9-12 *Ammobaculites alaskensis* Tappan (restr.) 148

1, 2 Hypotype A (GSC 57332); opposite side views of a typical adult specimen.

3, 4 Hypotype D (GSC 57335); opposite side views.

5, 6 Hypotype C (GSC 57334); opposite side views of a juvenile specimen.

9, 10 Hypotype G (GSC 57338); opposite side views of a coarser-grained variant.

11, 12 Hypotype H (GSC 57339); opposite side views of a robust, coarse-grained variety.

7, 8 13, 14 19, 20 *Ammobaculites alaskensis* Tappan (restr.) subsp. *5-5* . 150

7, 8 Figured specimen A (GSC 57340); opposite side views of typical adult specimen.

13, 14 Figured specimen D (GSC 57343); opposite side views.

19, 20 Figured specimen E (GSC 57344), opposite side views of adult specimen.

15-18, 21-31 *Ammobaculites* sp. *7-7* 166

15 Figured specimen H (GSC 57368); side view.

16, 17 Figured specimen A (GSC 57403); opposite side views of typical adult specimen.

18 Figured specimen B (GSC 57404); side view.

21-23 Figured specimen I (GSC 57369); opposite side and apertural views of large specimen.

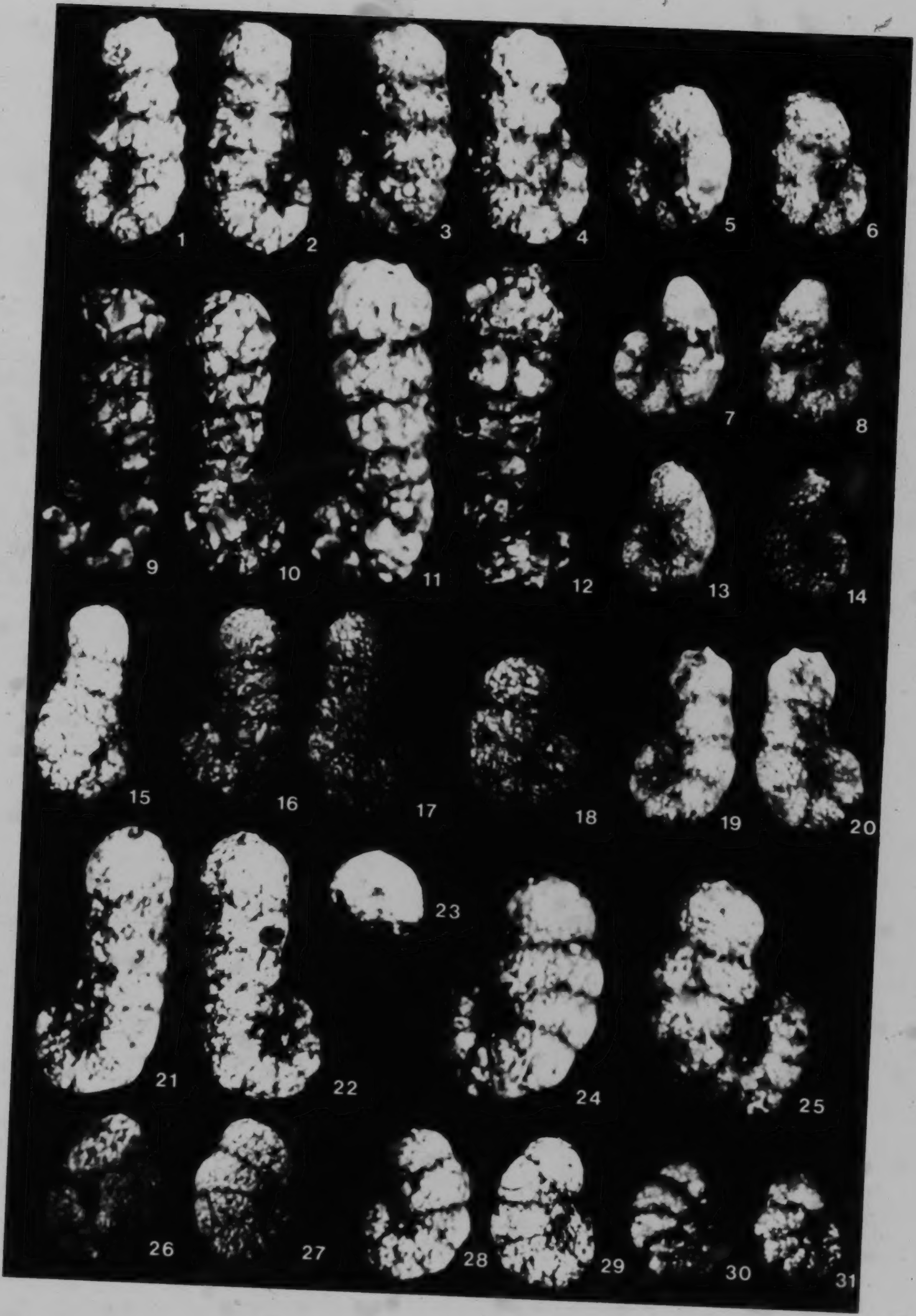
24, 25 Figured specimen G (GSC 57409); opposite side views of large variant with atypical, depressed umbilical area.

26, 27 Figured specimen D (GSC 57406); opposite side views of juvenile specimen. Note the arcuate shape of the sutures in the coiled portion.

EXPLANATION OF PLATE 14 (cont'd)

Figure		Page
	Ammobaculites sp. 7-7 (cont'd)	166
	28, 29 Figured specimen C (GSC 57405); opposite side views of young adult specimen.	
	30 Figured specimen E (GSC 57407); side view of juvenile form (uncoated) showing arcuate sutures in the coiled portion of the test.	
	31 Figured specimen F (GSC 57408); side view of juvenile specimen (uncoated) showing arcuate nature of sutures in coiled portion of the test.	

PLATE 14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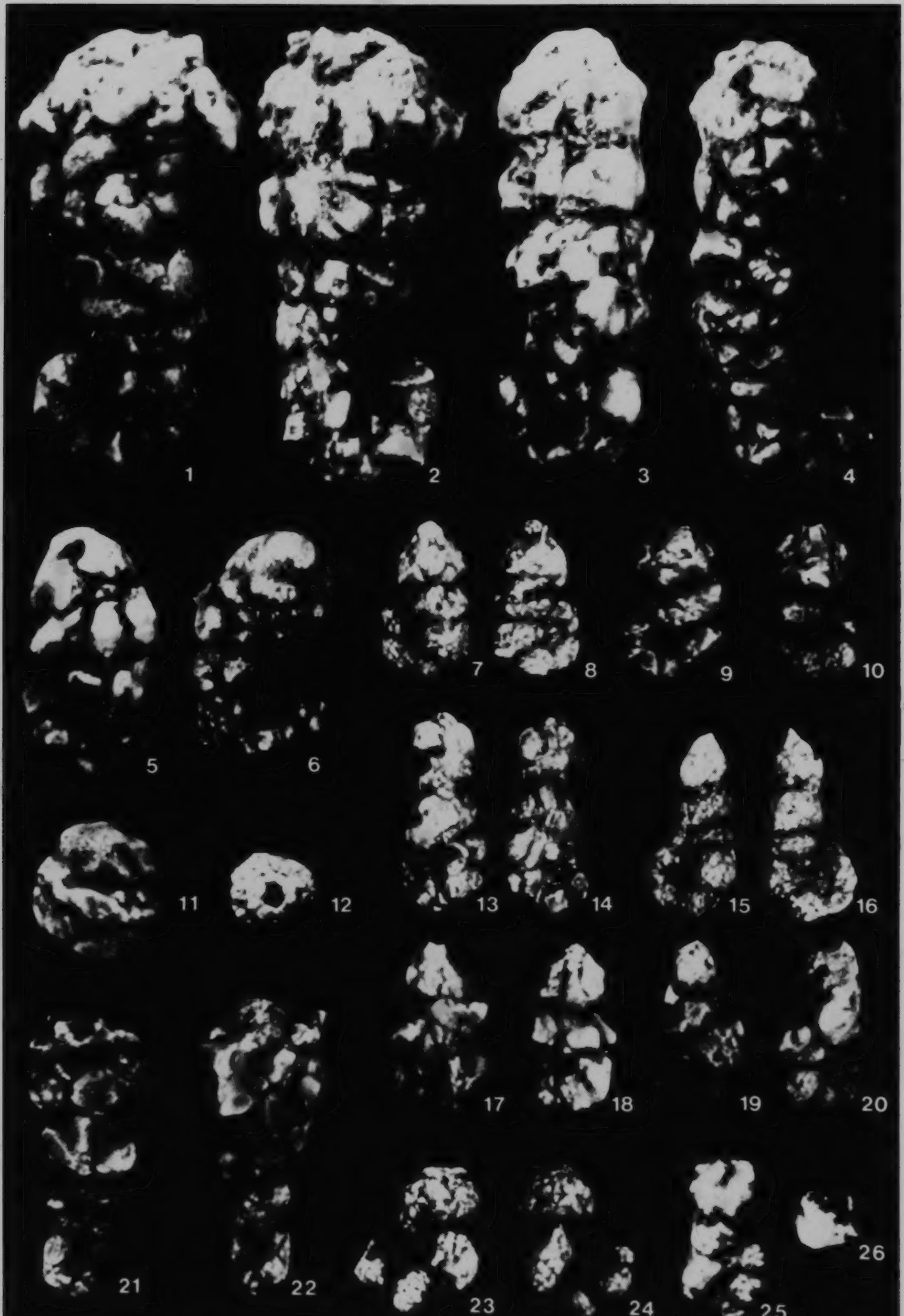
EXPLANATION OF PLATE 15

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-6	*Ammobaculites* sp. *7-10*	168
	1, 2 Figured specimen B (GSC 57411); opposite side views of robust adult specimen. 3, 4 Figured specimen A (GSC 57410); opposite side views. 5, 6 Figured apecimen G (GSC 57416); opposite side views of juvenile specimen.	
7-16, 21-24	*Ammobaculites* sp. cf. *A.* *multiformis* Dain	152
	7, 8 Figured specimen A (GSC 57346); opposite side views of typical adult specimen. 9, 10 Figured specimen D (GSC 57349); opposite side views. 13, 14 Figured specimen E (GSC 57350); opposite side views. 15, 16 Figured specimen C (GSC 57348); opposite side views. 11, 21, 22 Figured specimen F (GSC 57351); apertural and opposite side views of an unusually large specimen with a finely agglutinated coil and coarsely agglutinated uniserial portion. 12, 23, 24 Figured specimen G (GSC 57352); apertural and opposite side views of deviant juvenile specimen possessing ornate "flanged" chambers in the coiled portion.	
17-20, 25, 26	*Ammobaculites* sp. cf. *A.* *multiformis* Dain var. *2* . . .	155
	17, 18 Figured specimen A (GSC 57358); opposite side views. 19, 20 Figured specimen B (GSC 57359); opposite side views. 25, 26 Figured specimen C (GSC 57360); side and apertural views.	

PLATE 15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EXPLANATION OF PLATE 16

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure — Page

1-8, 10, 11 — Ammobaculites sp. 5-13 160

1-3 Figured specimen A (GSC 57376); opposite side and peripheral views of a typical adult specimen.

4, 5 Figured specimen B (GSC 57377); opposite side views.

6-8 Figured specimen G (GSC 57382); opposite side and peripheral views of juvenile form.

10, 11 Figured specimen I (GSC 58502); opposite side views of a large, partially damaged, deviant form with a 90° twist in direction from the coil to the uniserial portion.

9, 12-18 — Ammobaculites sp. 5-31 162

12-14 Figured specimen B (GSC 57384); opposite side and peripheral views of a large adult specimen.

9, 15 Figured specimen A (GSC 57383); apertural and side views.of adult form.

16-18 Figured specimen C (GSC 57385); opposite side and peripheral views.

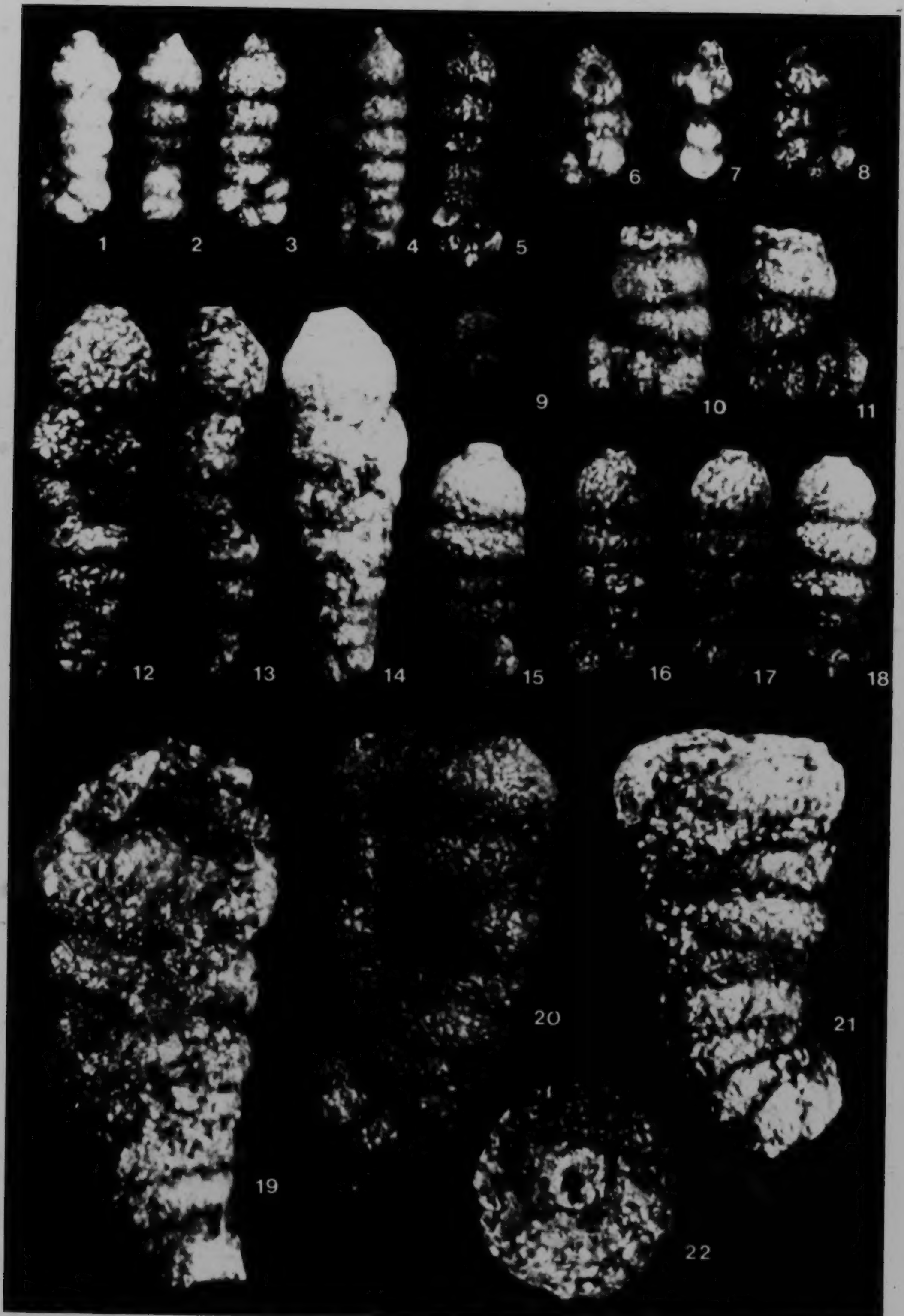
19-22 — Ammobaculites sp. 5-36 165

19 Figured specimen C (GSC 57398); side view of strongly crushed specimen with initial (coiled) portion missing.

20, 21 Figured specimen A (GSC 57396); opposite side views of a slightly compressed adult specimen.

22 Figured specimen G (GSC 57402); apertural view of specimen in which only ultimate chamber is preserved.

PLATE 16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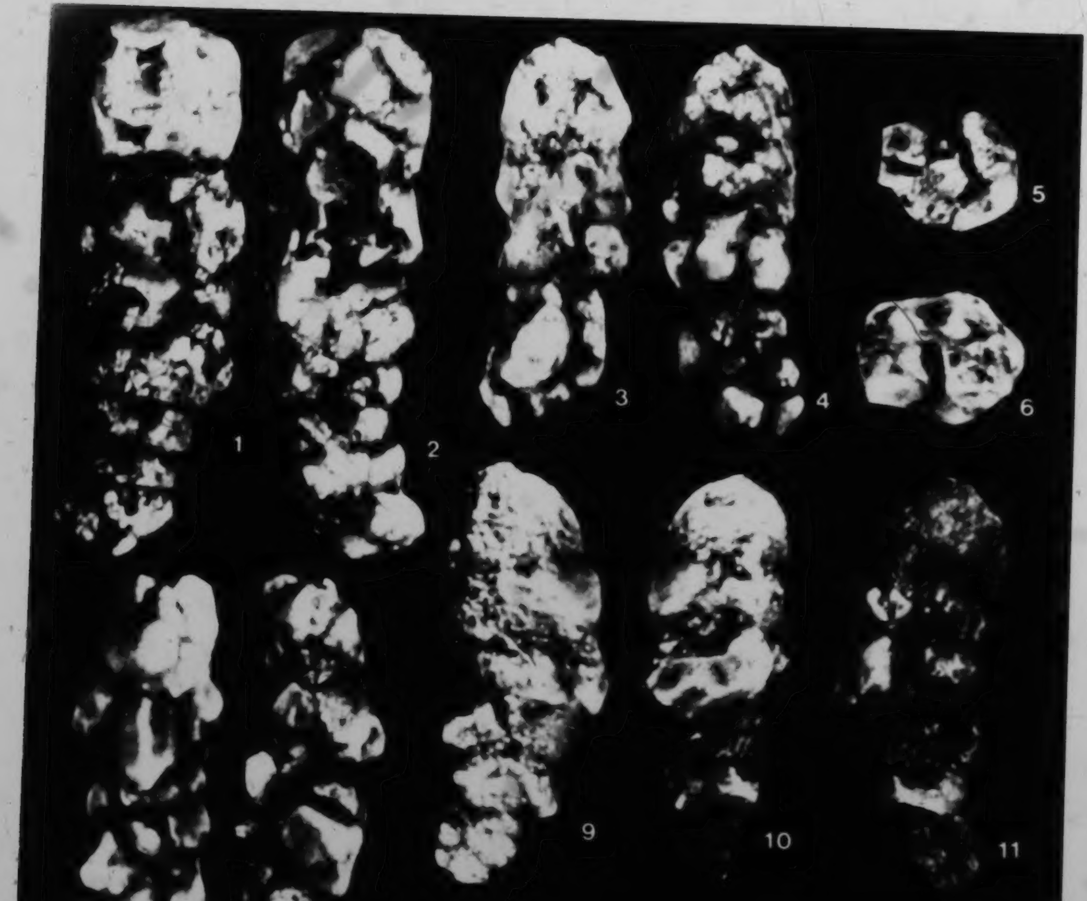
EXPLANATION OF PLATE 17

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-11	*Ammobaculites* sp. *5-9*	159
1, 2, 6 Figured specimen A (GSC 57370); opposite side and apertural views of robust adult specimen. 3-5 Figured specimen D (GSC 57373); opposite side and apertural views of specimen which is coarsely agglutinated in the initial portion and later becomes finely agglutinated. 7-8 Figured specimen E (GSC 57374); opposite side views of very coarsely agglutinated form. 9-11 Figured specimen F (GSC 57375); opposite side and peripheral views.
12-18	*Ammobaculites* sp. *7-24*	170
12-14 Figured specimen E (GSC 57394); opposite side and peripheral views of adult specimen. 15, 16 Figured specimen D (GSC 57393); opposite side views. 17, 18 Figured specimen B (GSC 57391); opposite side views.
19-22	*Ammobaculites* sp. cf. *A. multiformis* Dain var. *1* . . .	154
19, 20 Figured specimen E (GSC 57357); opposite side views of typical specimen. 21 Figured specimen A (GSC 57353); side view. 22 Figured specimen D (GSC 57356); side view.

PLATE 17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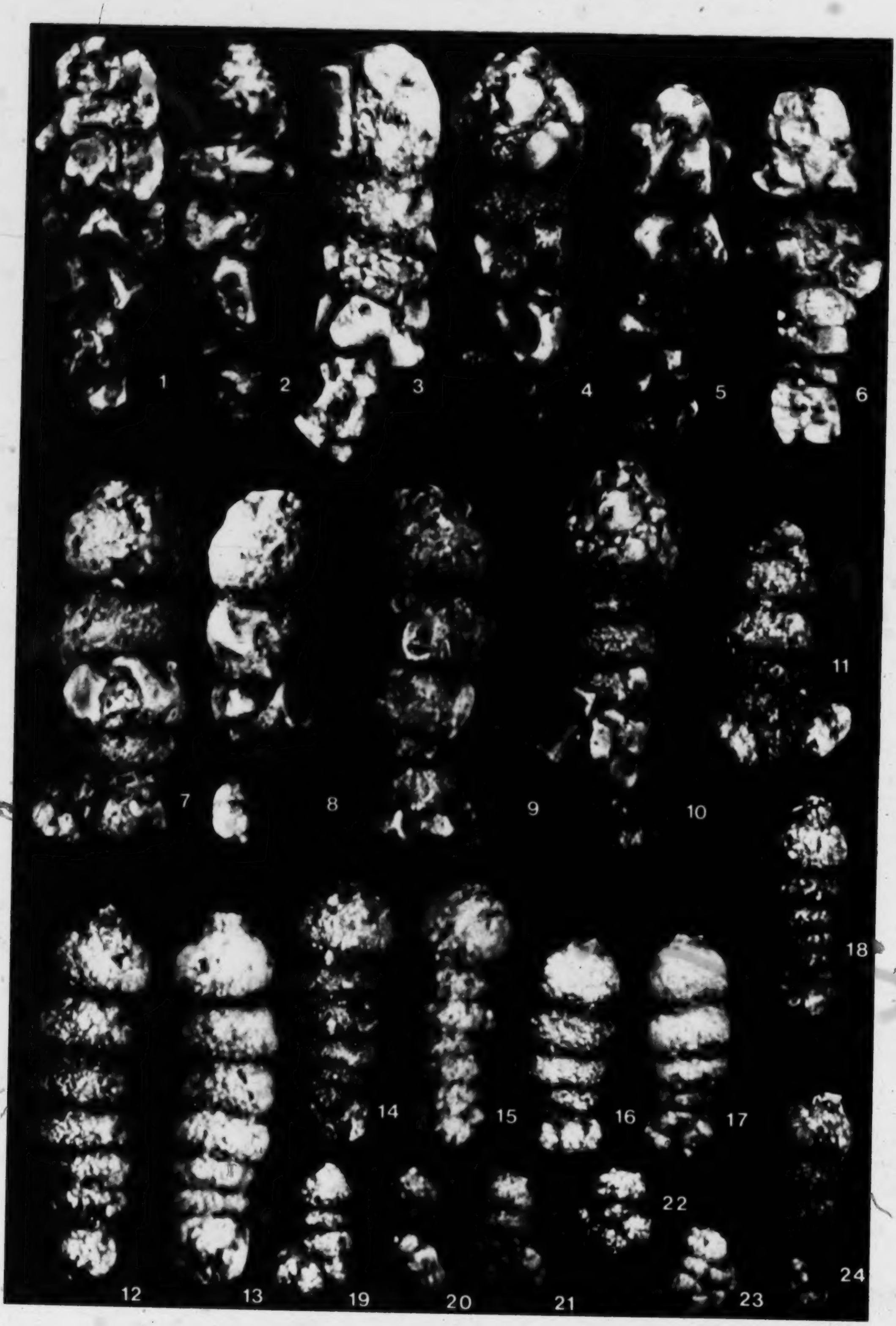
EXPLANATION OF PLATE 18

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-10	?Haplophragmium sp. 5-9	176
	1, 2 Figured specimen A (GSC 58491); side and peripheral views.	
	3, 4 Figured specimen B (GSC 58492); opposite side views.	
	5, 6 Figured specimen C (GSC 58493); opposite side views.	
	7-9 Figured specimen E (GSC 58495); opposite side and peripheral views.	
	10 Figured specimen F (GSC 58496); side view.	
11	Ammobaculites sp. 5-13	160
	11 Figured specimen H (GSC 58501); side view of deviant form	
12-17	Haplophragmium sp. 5-12	173
	12, 13 Figured specimen A (GSC 57423); opposite side views of large specimen.	
	14, 15 Figured specimen B (GSC 57424); opposite side views of adult specimen.	
	16, 17 Figured specimen E (GSC 57427); opposite side views.	
18-24	Haplophragmium sp. 5-13	174
	18, 24 Figured specimen A (GSC 57430); opposite side views of typical adult specimen.	
	19-21 Figured specimen C (GSC 57432); opposite side and peripheral views of immature specimen.	
	22, 23 Figured specimen G (GSC 57436); opposite side views of a juvenile specimen.	

PLATE 18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EXPLANATION OF PLATE 19

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure Page

1-10 *Ammodiscus* sp. cf. *A. orbis* Lalicker 77

1-3 Figured specimen A (GSC 57100); opposite side views; Figure 2 in transmitted light.

4, 5 Figured specimen C (GSC 57102); opposite side views.

6-8 Figured specimen E (GSC 57104); opposite side views; Figure 7 in transmitted light.

9 Figured specimen D (GSC 57103); side view.

10 Figured specimen B (GSC 57101); side view.

11-17 *Ammodiscus* sp. cf. *A. francisi* (Wall) 82

11 Figured specimen D (GSC 57118); side view.

12, 13 Figured specimen A (GSC 57115); apertural and side views.

14, 15 Figured specimen B (GSC 57116); side and apertural views.

16, 17 Figured specimen F (GSC 57120); opposite side views of megalospheric juvenile.

18-25 *Glomospira* sp. cf. *G. glomerosa* Eicher 90

18, 19 Figured specimen A (GSC 57137); opposite side views of adult specimen.

20, 21 Figured specimen B (GSC 57138); opposite side views of juvenile specimen.

22, 23 Figured specimen C (GSC 57139) opposite side views of juvenile specimen.

24, 25 Figured specimen G (GSC 57143); opposite side views of adult specimen.

EXPLANATION OF PLATE 19 (cont'd)

Figure Page

26-33 *Glomospira* sp. cf. *G. tortuosa* Eicher 92

26, 27 Figured specimen A (GSC 57144); opposite side views of adult specimen.

28, 29 Figured specimen C (GSC 57146); opposite side views of juvenile specimen.

30, 31 Figured specimen G (GSC 57150); opposite side views.

32, 33 Figured specimen F (GSC 57149); opposite side views.

34-41 ?*Lituotuba* sp. *5-5* 101

34, 35 Figured specimen A (GSC 57174); side and peripheral views. Note partially straightened portion of tube designated "a" in Figure 34. This bears the aperture.

36, 37 Figured specimen C (GSC 57176); this specimen may be attached to a sand grain.

38, 39 Figured specimen E (GSC 57178); side and basal views. Note partially straightened portion of tube designated "a" in Figure 38. This bears the aperture.

40, 41 Figured specimen F (GSC 57179); two views.

42, 43 *Turritellella* sp. *5-20* 95

42 Figured specimen A (GSC 57155); side view of complete adult specimen.

43 Figured specimen C (GSC 57157); side view of juvenile specimen.

44-46 *Turritellella* sp. *5-25* 97

44 Figured specimen B (GSC 57159); side view of broken specimen.

45 Figured specimen C (GSC 57160); side view.

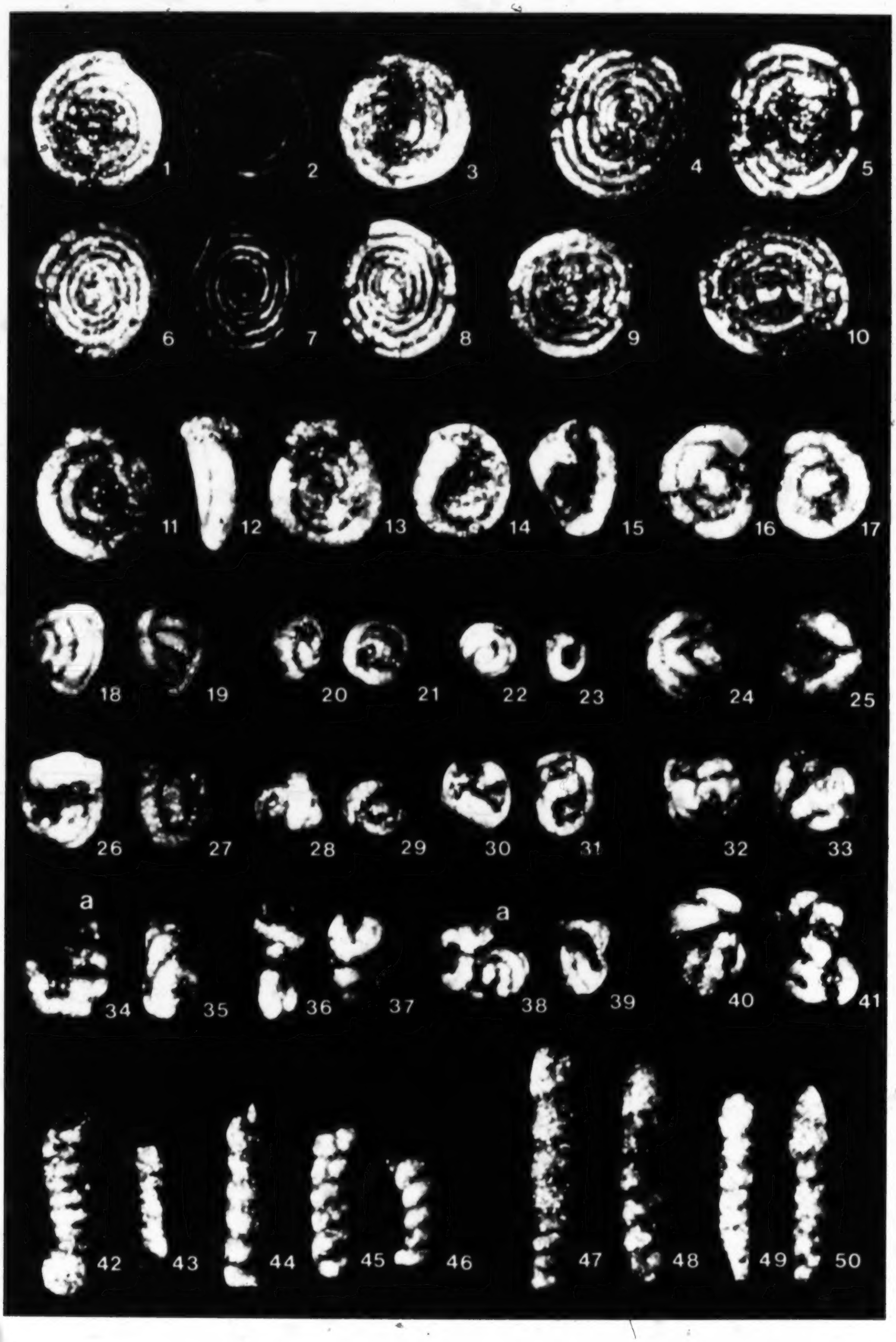
46 Figured specimen D (GSC 57161); side view of broken juvenile specimen.

EXPLANATION OF PLATE 19 (cont'd)

Figure		Page
47-50	*Reophax minuta* Tappan	102

47 Hypotype A (GSC 57180); side view of adult specimen.
48 Hypotype B (GSC 57181); side view.
49 Hypotype C (GSC 57182); side view.
50 Hypotype D (GSC 57183); side view.

PLATE 19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EXPLANATION OF PLATE 20

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure — Page

1-5 *Reophax* sp. *5-25* 109

1 Figured specimen E (GSC 57207); side view.
2 Figured specimen A (GSC 57203); side view.
3 Figured specimen B (GSC 57204); side view.
4 Figured specimen G (GSC 57209); side view.
5 Figured specimen D (GSC 57206); side view.

6-13 *Haplophragmoides* sp. cf. *H*. *tryssa* Loeblich and Tappan . 114

6-8 Figured specimen A (GSC 57214); opposite side and apertural views of typical adult form.

9-11 Figured specimen C (GSC 57216); opposite side and apertural views.

12, 13 Figured specimen E (GSC 57218); opposite side views.

14-21 *Haplophragmoides* sp. cf. *H*. *tryssa* Loeblich and Tappan var. *1* 116

14-16 Figured specimen A (GSC 57220); opposite side and apertural views of adult specimen.

17, 18 Figured specimen E (GSC 57224); opposite side views.

19-21 Figured specimen B (GSC 57221); opposite side and apertural views.

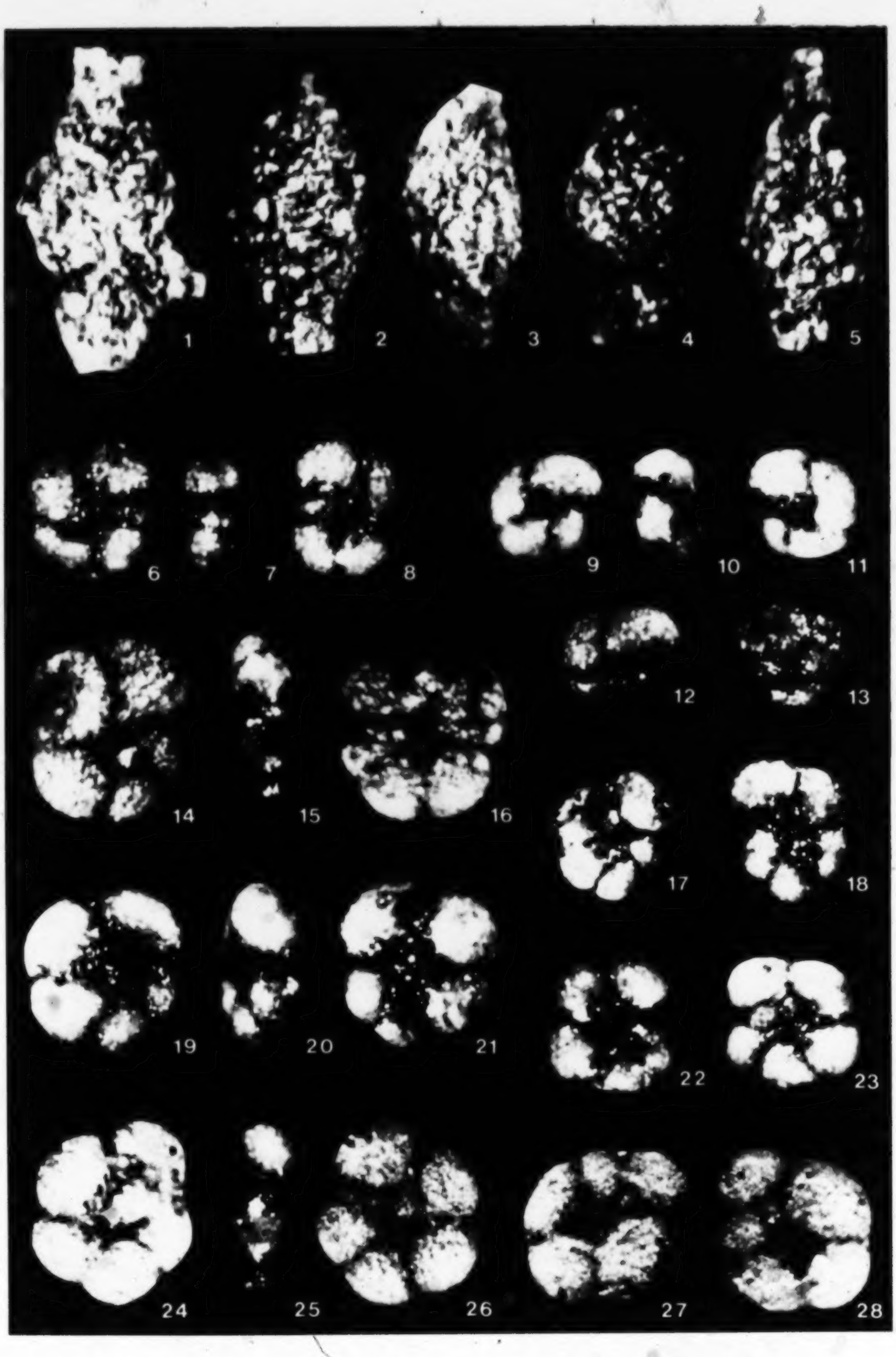
22-28 *Haplophragmoides* sp. cf. *H*. *tryssa* Loeblich and Tappan var. *2* 117

22, 23 Figured specimen A (GSC 57226); opposite side views.

24-26 Figured specimen B (GSC 57227); opposite side and apertural views.

27, 28 Figured specimen E (GSC 57230); opposite side views.

PLATE 20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EXPLANATION OF PLATE 21

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-8	Haplophragmoides sp. 5-61	119

1-3 Figured specimen C (GSC 57233); opposite side and apertural views. The ultimate chamber is slightly damaged.

4, 5 Figured specimen B (GSC 57232); side and apertural views.

6-8 Figured specimen D (GSC 57234); opposite side and apertural views.

Figure		Page
9-23	Recurvoides sp. 5-11	144

9, 10 Figured specimen F (GSC 57326); opposite side views of juvenile specimen.

11, 12 Figured specimen G (GSC 57327); opposite side views of juvenile specimen.

13-16 Figured specimen A (GSC 57321); opposite side and apertural views of robust adult specimen. Figure 16 shows the form in transmitted light. Note the chamber arrangement and the raised (areal) nature of the aperture.

17, 21-23 Figured specimen B (GSC 57322); opposite side and apertural views of adult specimen. Figure 17 shows the test in transmitted light.

18-20 Figured specimen C (GSC 57323); opposite side and apertural views.

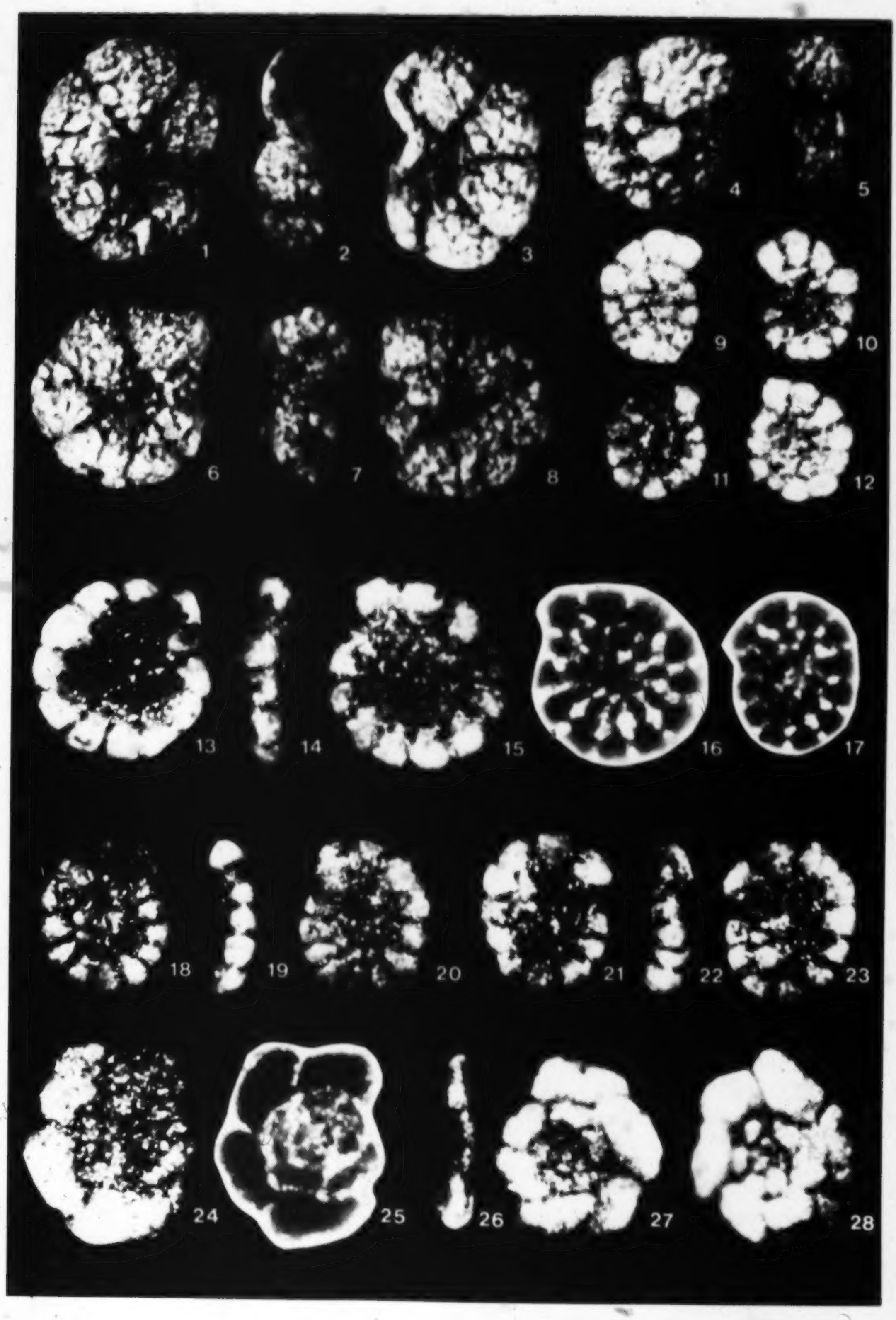
Figure		Page
24-28	Trochamminoides sp. 6-13	129

24, 25 Figured specimen D (GSC 57263); side views in reflected and transmitted light of slightly damaged specimen. Note that the aperture is located at the base of the chamber.

26, 27 Figured specimen C (GSC 57262); apertural and side views of typical adult specimen.

28 Figured specimen A (GSC 57260); side view.

PLATE 21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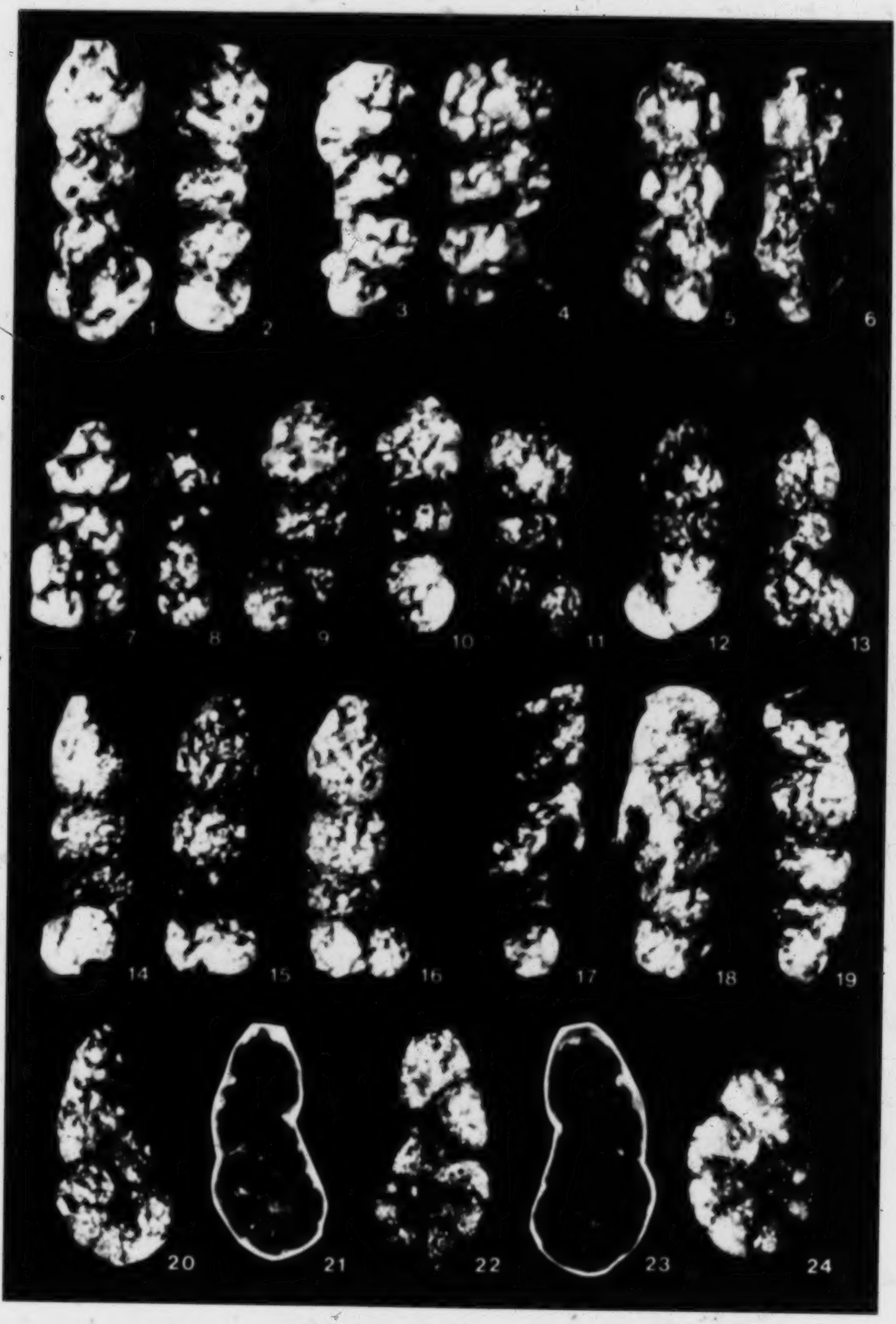
EXPLANATION OF PLATE 22

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-8	*Ammobaculites* sp. cf. *A.* *venustus* Loeblich and Tappan .	157
	1, 2 Figured specimen D (GSC 57364); side and peripheral views.of adult specimen.
	3, 4 Figured specimen C (GSC 57363); peripheral and side views.
	5, 6 Figured specimen E (GSC 57365); opposite side views.
	7, 8 Figured specimen A (GSC 57361); side and peripheral views of juvenile specimen.
9-19	*Haplophragmium* *pokrovkaensis* Kosyreva	171
	9-11 Hypotype D (GSC 57420); opposite side and peripheral views of immature specimen.
	12, 13 Hypotype B (GSC 57418); opposite side views.
	14-16 Hypotype A (GSC 57417); opposite side and peripheral views of adult specimen.
	17-19 Hypotype E (GSC 57421); opposite side and peripheral views of poorly preserved specimen.
20-24	*Ammobaculoides* sp. *7-13*	177
	20, 22 Figured specimen A (GSC 57437); opposite side views.
	21, 23 Figured specimen A (GSC 57437); opposite side views in transmitted light showing chamber arrangement.
	24 Figured specimen G (GSC 57443); side view of juvenile form.

PLATE 22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EXPLANATION OF PLATE 23

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-5	Ammobaculoides sp. 7-13	177
	1, 2 Figured specimen B (GSC 57438); side views in reflected and transmitted light.	
	3-5 Figured specimen D (GSC 57440); side views in reflected and transmitted light.	
6-10	Spiroplectammina sp. 5-23	181
	6, 7 Figured specimen A (GSC 57450); peripheral and side views of adult specimen.	
	8, 9 Figured specimen B (GSC 57451); side and peripheral views.	
	10 Figured specimen C (GSC 57452); side view.	
11-15, 17, 18	Textularia sp. cf. T. areoplecta Tappan	183
	11, 12 Figured specimen A (GSC 57456); peripheral and side views. Note well preserved aperture (low arch) at base of terminal chamber in Figure 11.	
	13, 14 Figured specimen B (GSC 57457); peripheral and side views.	
	15 Figured specimen D (GSC 57459); side view.	
	17 Figured specimen E (GSC 57460); side view of robust specimen with initial portion missing.	
	18 Figured specimen F (GSC 57461); side view of robust specimen.	
16	Textularia sp. 5-20	184
	16 Figured specimen A (GSC 57462); side view.	

EXPLANATION OF PLATE 23 (cont'd)

Figure — Page

19-23 *Pseudobolivina* sp. *5-27* 185

19, 20 Figured specimen A (GSC 57464); side and peripheral views of rather slim specimen.

21 Figured specimen B (GSC 57465); side view of more common, robust variety.

22 Figured specimen C (GSC 57466); side view.

23 Figured specimen D (GSC 57467); side view.

24 *Pseudobolivina*(?) sp. *5-19* 187

24 Figured specimen A (GSC 57470); side view.

25-31 *Siphotextularia* sp. *5-4* 188

25 Figured specimen A (GSC 57473); side view. Note nearly 90° twist in axis of test.

26, 27 Figured specimen B (GSC 57474); side and peripheral views of robust specimen.

28, 29 Figured specimen C (GSC 57475); side and peripheral views.

30, 31 Figured specimen D (GSC 57476); side and peripheral views.

32, 33 *Siphotextularia* sp. *7-13* 190

32 Figured specimen A (GSC 57484); side view. Note the clearly defined "siphon" (tube on which the aperture is projected) passing from the penultimate to the ultimate chambers.

33 Figured specimen B (GSC 57485); side view.

34-37 *Siphotextularia* sp. *5-5* 189

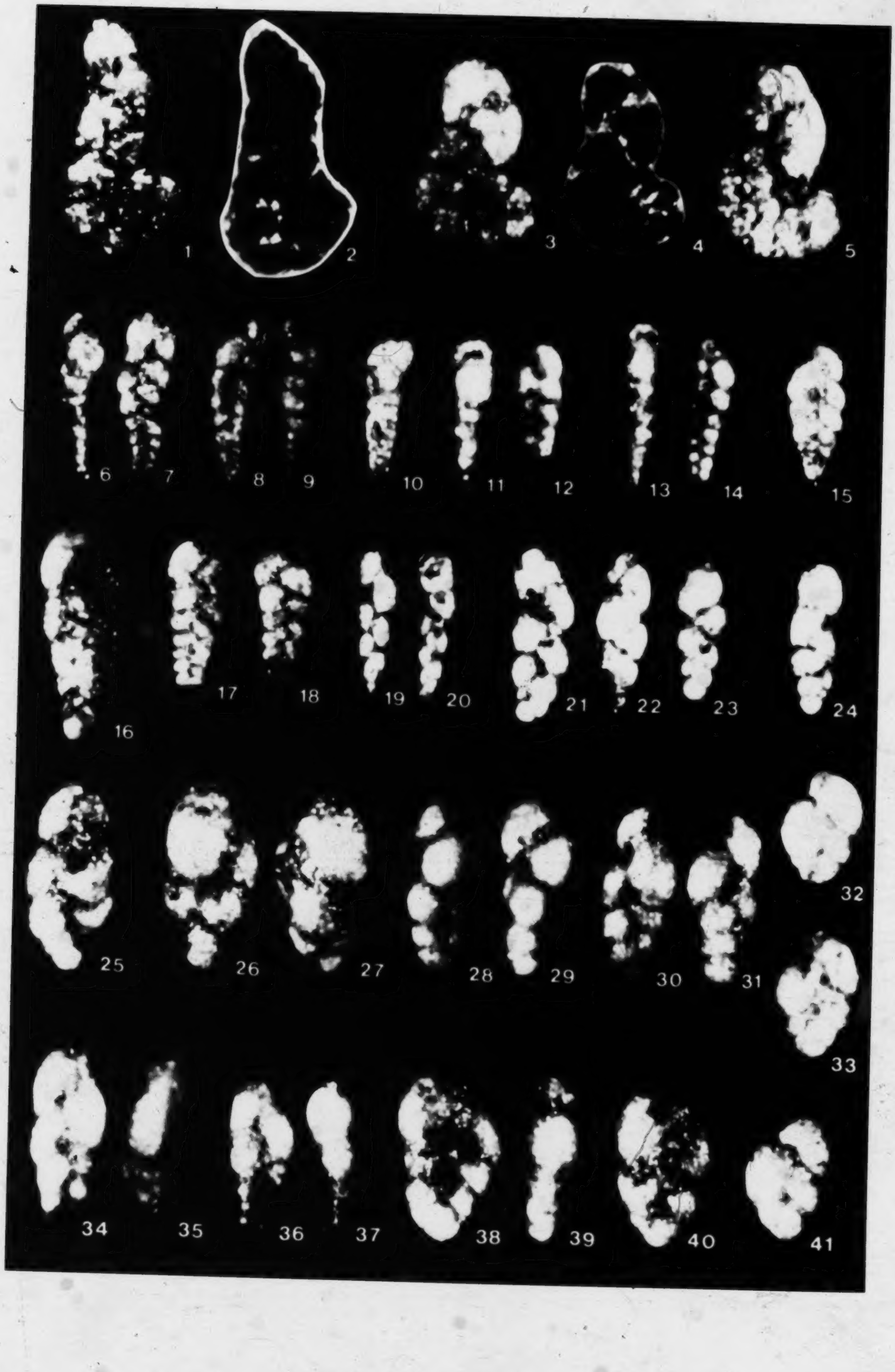
34, 35 Figured specimen A (GSC 57479); side and peripheral views.

36, 37 Figured specimen B (GSC 57480); side and peripheral views.

EXPLANATION OF PLATE 23 (cont'd)

Figure		Page
38-41	Siphotextularia s. l. sp. 5-10	191
	38, 39 Figured specimen A (GSC 57487); side and peripheral views of typical adult specimen.	
	40 Figured specimen B (GSC 57488); side view.	
	41 Figured specimen C (GSC 57489); side view.	

PLATE 23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EXPLANATION OF PLATE 24

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-18	*Trochammina* sp. cf. *T. elevata* Kosyreva	196

1-3 Figured specimen A (GSC 57504); dorsal, side and ventral views of a microspheric heteromorph.

4-6 Figured specimen C (GSC 57506); dorsal, side and ventral views of a microspheric adult.

7-9 Figured specimen B (GSC 57505); dorsal, side and ventral views of a microspheric heteromorph. The aperture is visible as a semi-circular arch at the base of the ultimate chamber in Figure 9.

10-12 Figured specimen F (GSC 58001); dorsal, side and ventral views of a megalospheric heteromorph.

13-15 Figured specimen D (GSC 57507); dorsal, side and ventral views of a microspheric juvenile.

16-18 Figured specimen G (GSC 58002); dorsal, side and ventral views of a megalospheric juvenile.

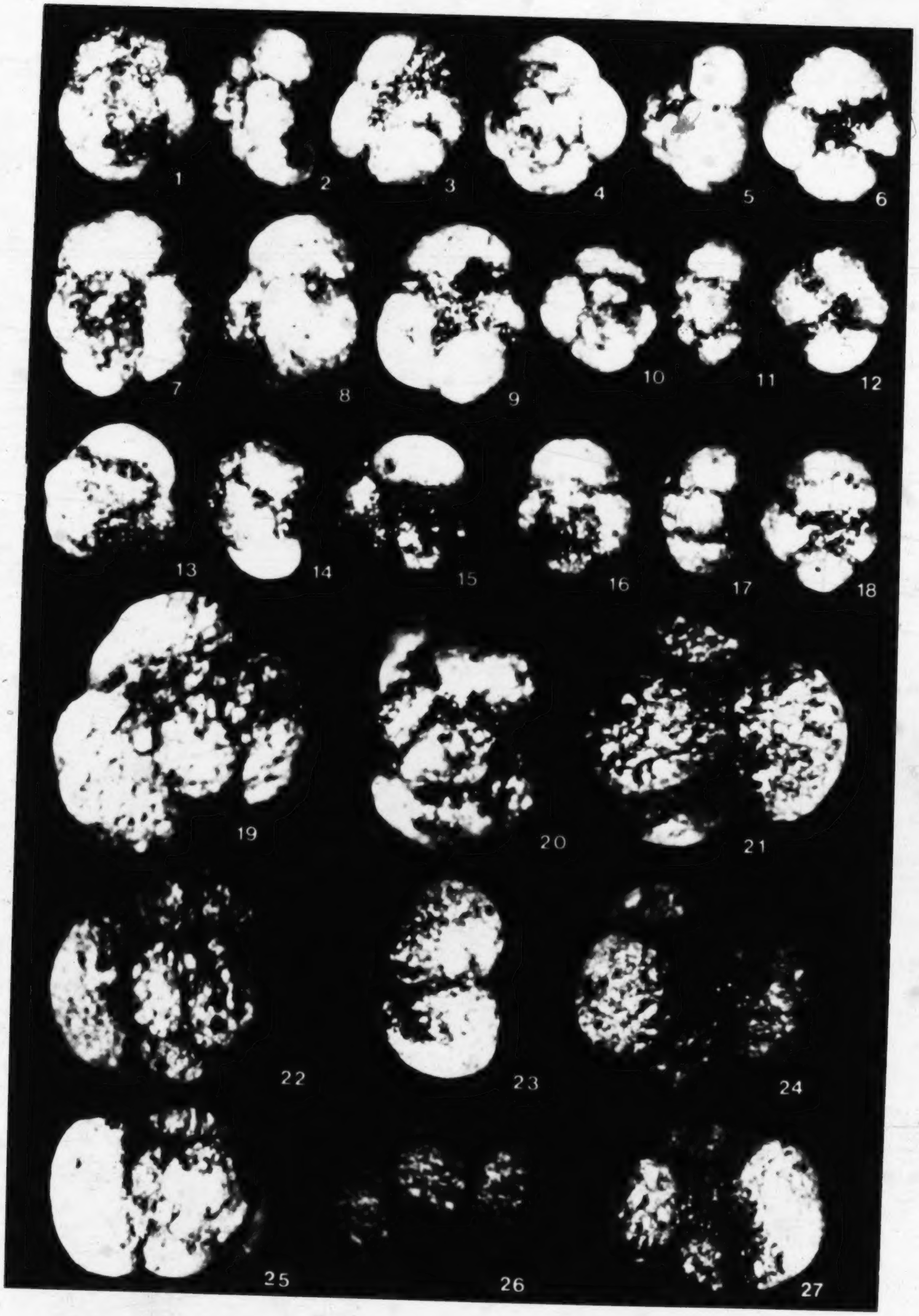
Figure		Page
19-27	*Trochammina* sp. cf. *T. elevata* Kosyreva subsp. *1* . .	198

19-21 Figured specimen B (GSC 58004); dorsal, side and ventral views. Note the greatly inflated chambers of the ultimate whorl.

22-24 Figured specimen D (GSC 58006); dorsal, side and ventral views. The initial whorl is missing.

25-27 Figured specimen C (GSC 58005); dorsal, side and ventral views.

PLATE 24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EXPLANATION OF PLATE 25

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

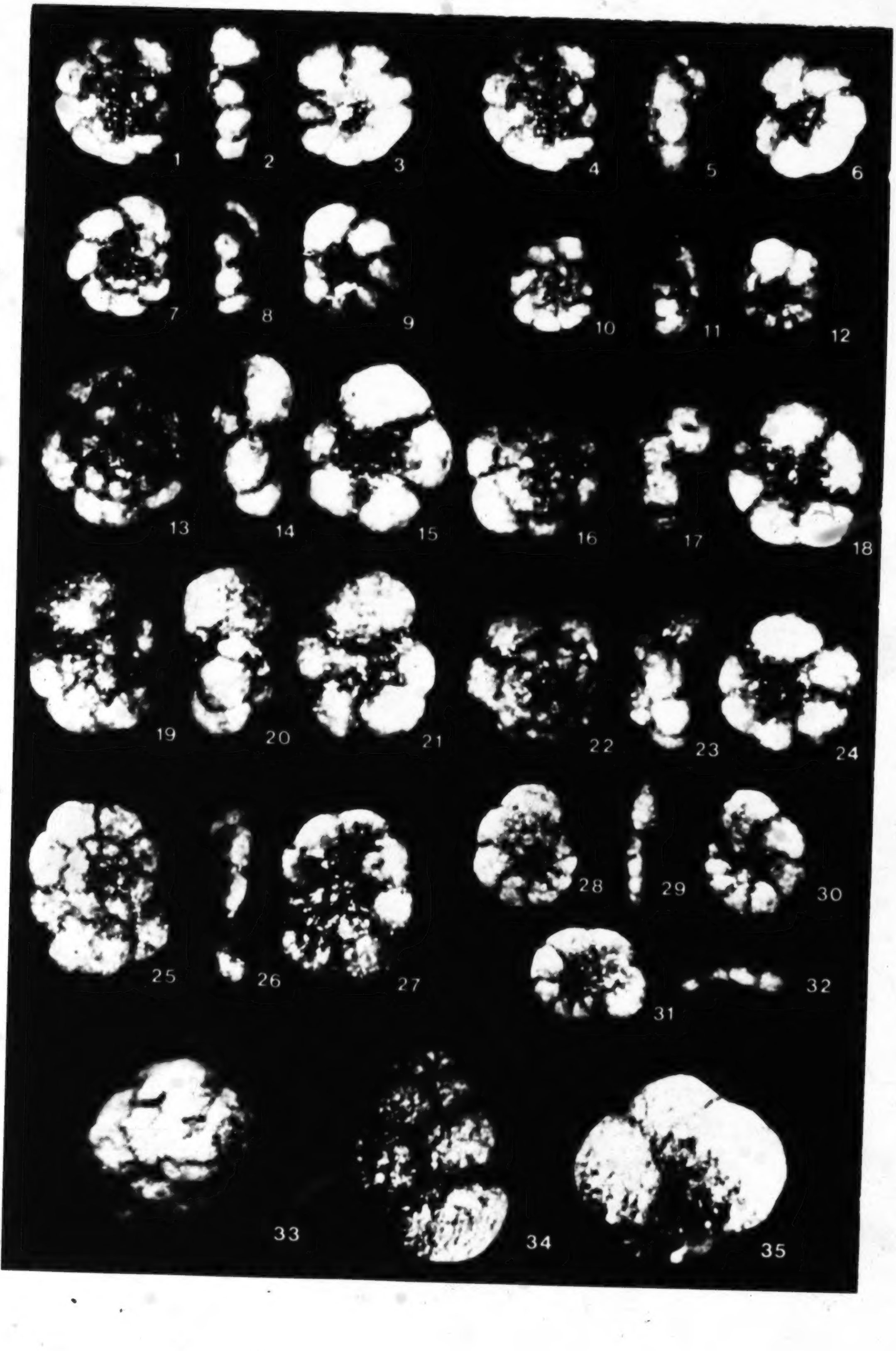
Figure		Page
1-12	Trochammina omskensis Kosyreva	194
	1-3 Hypotype E (GSC 57502); dorsal, side and ventral views of a dextrally coiled, microspheric adult.	
	4-6 Hypotype A (GSC 57498); dorsal, side and ventral views of dextrally coiled, microspheric heteromorph.	
	7-9 Hypotype B (GSC 57499); dorsal, side and ventral views of a dextrally coiled, microspheric heteromorph. Note the low spire and umbilical depression.	
	10-12 Hypotype C (GSC 57500); dorsal, side and ventral views of dextrally coiled, microspheric juvenile.	
13-24	Trochammina sp. 5-13	201
	13-15 Figured specimen A (GSC 58016); dorsal, side and ventral views of dextrally coiled, microspheric adult.	
	16-18 Figured specimen D (GSC 58019); dorsal, side and ventral views of dextrally coiled, microspheric juvenile.	
	19-21 Figured specimen C (GSC 58018); dorsal, side and ventral views of sinistrally coiled, megalospheric heteromorph.	
	22-24 Figured specimen F (GSC 58021); dorsal, side and ventral views of dorsally coiled, microspheric juvenile.	
25-32	Trochammina sp. 5-27	203
	25-27 Figured specimen A (GSC 58030); dorsal, side and ventral views of sinistrally coiled, microspheric adult. Note the "flatness" of the test.	
	28-30 Figured specimen D (GSC 58033); dorsal, side and ventral views of dextrally coiled, microspheric adult.	
	31, 32 Figured specimen B (GSC 58031); dorsal and side views of dextrally coiled, microspheric adult.	

EXPLANATION OF PLATE 25 (cont'd)

Figure		Page
33-35	Trochammina(?) sp. 29109	210

33-35 Figured specimen A (GSC 58061); dorsal, side and ventral views of dextrally coiled, microspheric heteromorph. Note the very high nature of the spire.

PLATE 25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EXPLANATION OF PLATE 26

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

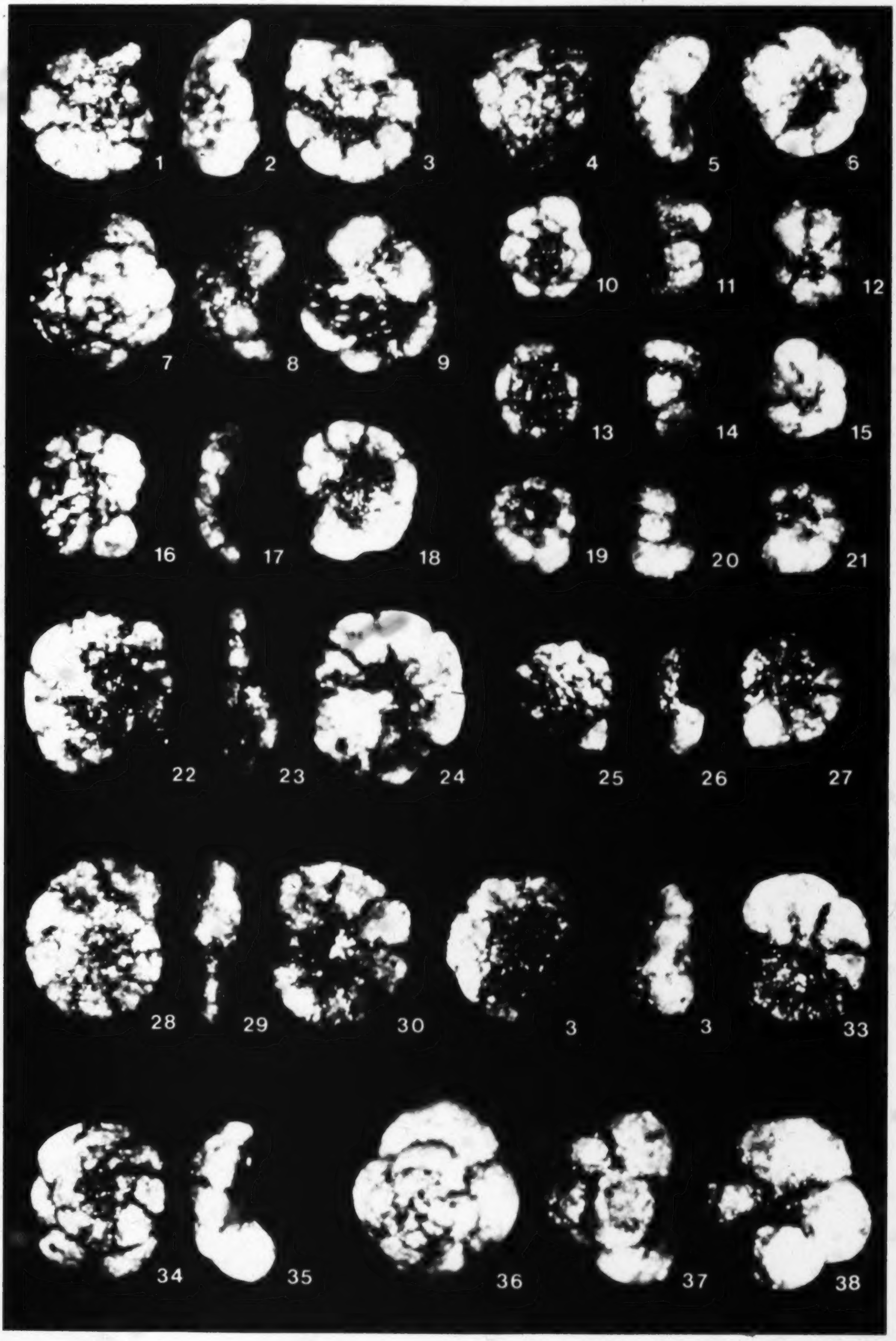
Figure		Page
1-9, 16-18	Trochammina sp. 5-25 . . . . 1-3 Figured specimen B (GSC 58024); dorsal, side and ventral views of dextrally coiled, microspheric adult. 4-6 Figured specimen A (GSC 58023); dorsal, side and ventral views of dextrally coiled, microspheric heteromorph. Note deep ventral depression, and concavo-convex shape of test. 7-9 Figured specimen G (GSC 58029); dorsal, side and ventral views of dextrally coiled, microspheric adult. 16-18 Figured specimen C (GSC 58025); dorsal, side and ventral views of sinistrally coiled, microspheric juvenile.	202
10-15, 19-21	Trochammina sp. 7-13A . . . . 10-12 Figured specimen A (GSC 58037); dorsal, side and ventral views of dextrally coiled, microspheric adult. 13-15 Figured specimen B (GSC 58038); dorsal, side and ventral views of dextrally coiled, microspheric adult. 19-21 Figured specimen C (GSC 58039); dorsal, side and ventral views of sinistrally coiled, microspheric adult.	204
22-35	Trochammina sp. 7-13B . . . . 22-24 Figured specimen A (GSC 58044); dorsal, side and ventral views of sinistrally coiled, microspheric adult. 25-27 Figured specimen C (GSC 58046); dorsal, side and ventral views of sinistrally coiled, microspheric juvenile. 28-30 Figured specimen B (GSC 58045); dorsal, side and ventral views of dextrally coiled, microspheric adult. 31-33 Figured specimen D (GSC 58047); dorsal, side and ventral views of dextrally coiled, microspheric adult. 34, 35 Figured specimen E (GSC 58048); dorsal and side views of sinistrally coiled, microspheric adult.	206

EXPLANATION OF PLATE 26 (cont'd)

Figure		Page
36-38	Trochammina sp. 7-20	207

36-38 Figured specimen F (GSC 58054); dorsal, side and ventral views of adult specimen with damaged initial portion.

PLATE 26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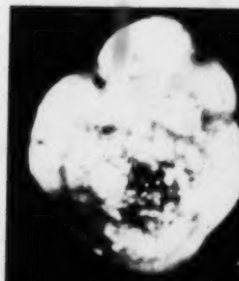
EXPLANATION OF PLATE 27

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-9	Trochammina sp. 7-20	207
	1-3 Figured specimen C (GSC 58051); dorsal, side and ventral views of dextrally coiled, microspheric adult.	
	5-7 Figured specimen A (GSC 58049); dorsal, side and ventral views of sinistrally coiled, microspheric adult.	
	4, 8, 9 Figured specimen D (GSC 58052); dorsal, side and ventral views of sinistrally coiled, megalospheric adult.	
10-21	Trochammina sp. 7-21	209
	10-12 Figured specimen C (GSC 58057); dorsal, side and ventral views of dextrally coiled, microspheric adult.	
	14-16 Figured specimen A (GSC 58055); dorsal, side and ventral views of slightly deformed, sinistrally coiled, microspheric adult.	
	18-20 Figured specimen D (GSC 58058); dorsal, side and ventral views of sinistrally coiled, microspheric adult.	
	13, 17, 21 Figured specimen E (GSC 58059); dorsal, side and ventral views of dextrally coiled, ?megalospheric adult. The intial portion of the test is missing.	

PLATE 27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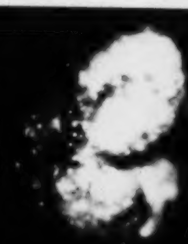
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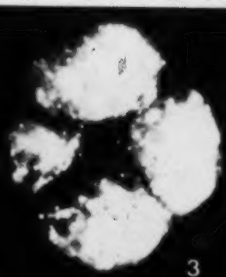
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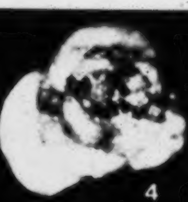
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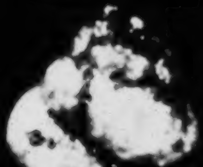
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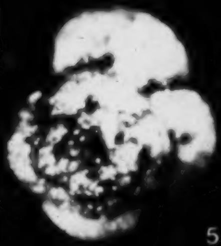
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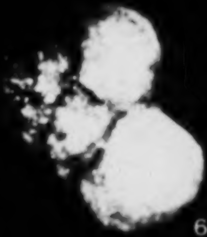
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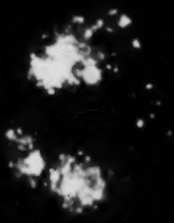
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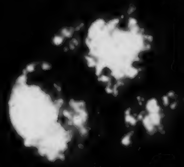
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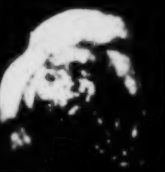
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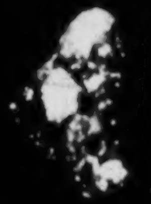
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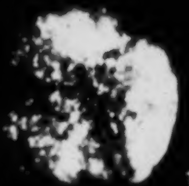
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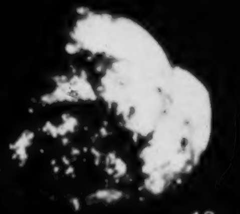
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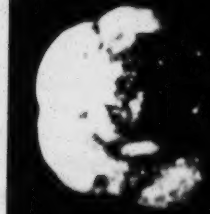
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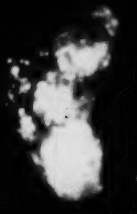
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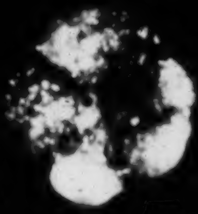
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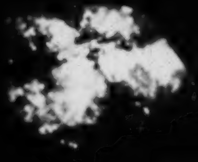
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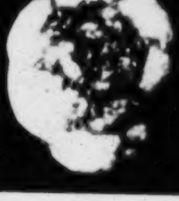
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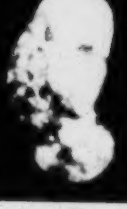
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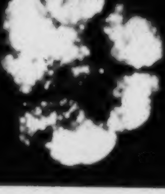
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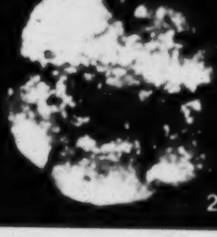
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EXPLANATION OF PLATE 28

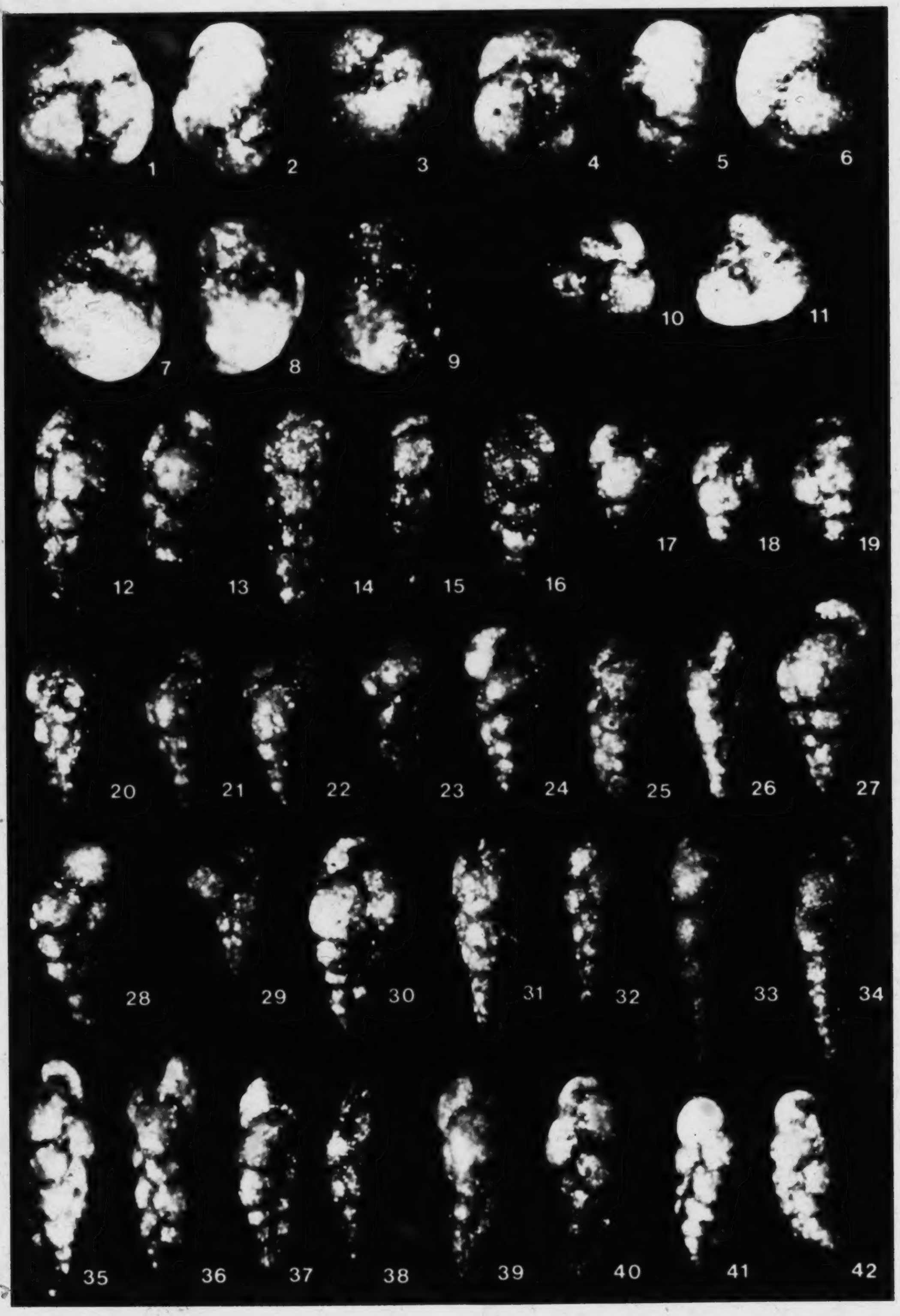
All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-11	?*Ammosphaeroidina* sp. *5-23*	212
	1-3 Figured specimen A (GSC 58066); opposite side and peripheral views.	
	4-6 Figured specimen B (GSC 58067); opposite side and peripheral views.	
	7-9 Figured apecimen C (GSC 58068); opposite side and peripheral views.	
	10, 11 Figured specimen D (GSC 58069); opposite side views.	
12-16, 28	*Verneuilinoides* sp. cf. *V*. *graciosus* Kosyreva var. *1* .	219
	12 Figured specimen B (GSC 58090); side view.	
	13 Figured specimen A (GSC 58089); side view.	
	14 Figured specimen D (GSC 58092); side view.	
	15 Figured specimen F (GSC); side view.	
	16 Figured specimen E (GSC 58093); side view.	
	28 Figured specimen C (GSC 58091); side view.	
17-19	*Verneuilinoides* sp. cf. *V*. *graciosus* Kosyreva var. *2* .	220
	17 Figured specimen A (GSC 58094); side view.	
	18 Figured specimen B (GSC 58095); side view.	
	19 Figured specimen C (GSC 58096); side view.	
20-27	*Verneuilinoides* sp. cf. *V*. *graciosus* Kosyreva var. *3* forma *A*	221
	20, 21 Figured specimen A (GSC 58097); side views.	
	22 Figured specimen B (GSC 58098); side view.	
	23, 24 Figured specimen E (GSC 58101); side views.	
	25, 26 Figured specimen C (GSC 58099); side views.	
	27 Figured specimen D (GSC 58100); side view.	

EXPLANATION OF PLATE 28 (cont'd)

Figure		Page
29, 30	Verneuilinoides sp. cf. V. graciosus Kosyreva var. 3 forma B	223
	29 Figured specimen A (GSC 58103); side view.	
	30 Figured specimen B (GSC 58104); side view.	
31-34	Verneuilinoides sp. cf. V. postgraciosus Komissarenko .	224
	31 Figured specimen C (GSC 58109); side view.	
	32 Figured specimen D (GSC 58110); side view.	
	33 Figured specimen B (GSC 58108); side view.	
	34 Figured specimen A (GSC 58107); side view.	
35-42	Verneuilinoides sp. A	225
	35, 26 Figured specimen A (GSC 58112); side views.	
	37, 38 Figured specimen B (GSC 58113); side views.	
	39, 40 Figured specimen C (GSC 58114); side views.	
	41, 42 Figured specimen E (GSC 58116); side views.	

PLATE 28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EXPLANATION OF PLATE 29

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-5	Verneuilina sp. cf. V. anglica Cushman var. 1	215
	1 Figured specimen A (GSC 58073); side view.	
	2 Figured specimen B (GSC 58074); side view.	
	3 Figured specimen F (GSC 58078); side view.	
	4 Figured specimen E (GSC 58077); side view.	
	5 Figured specimen D (GSC 58076); side view.	
6, 7	Verneuilina sp. cf. V. anglica Cushman var. 2	216
	6 Figured specimen C (GSC 58081); side view.	
	7 Figured specimen D (GSC 58082); side view.	
8-16	Verneuilina sp. A.	217
	8 Figured specimen A (GSC 58083); side view.	
	9, 10 Figured specimen B (GSC 58084); side views.	
	11, 12 Figured specimen D (GSC 58086); side views.	
	13, 14 Figured specimen C (GSC 58085); side views.	
	15, 16 Figured specimen F (GSC 58088); side views.	
17-25	Orientalia sp. 7-13	241
	17, 18 Figured specimen A (GSC 58145); side views of uncoated and coated specimen. Note quadriserial chamber arrangement in the ultimate whorl, and sharp apex.	
	19, 20 Figured specimen E (GSC 58149); side views.	
	21, 25 Figured specimen C (GSC 58147); side views.	
	22, 23 Figured specimen B (GSC 58146); side views.	
	24 Figured specimen D (GSC 58148); side views.	

EXPLANATION OF PLATE 29 (cont'd)

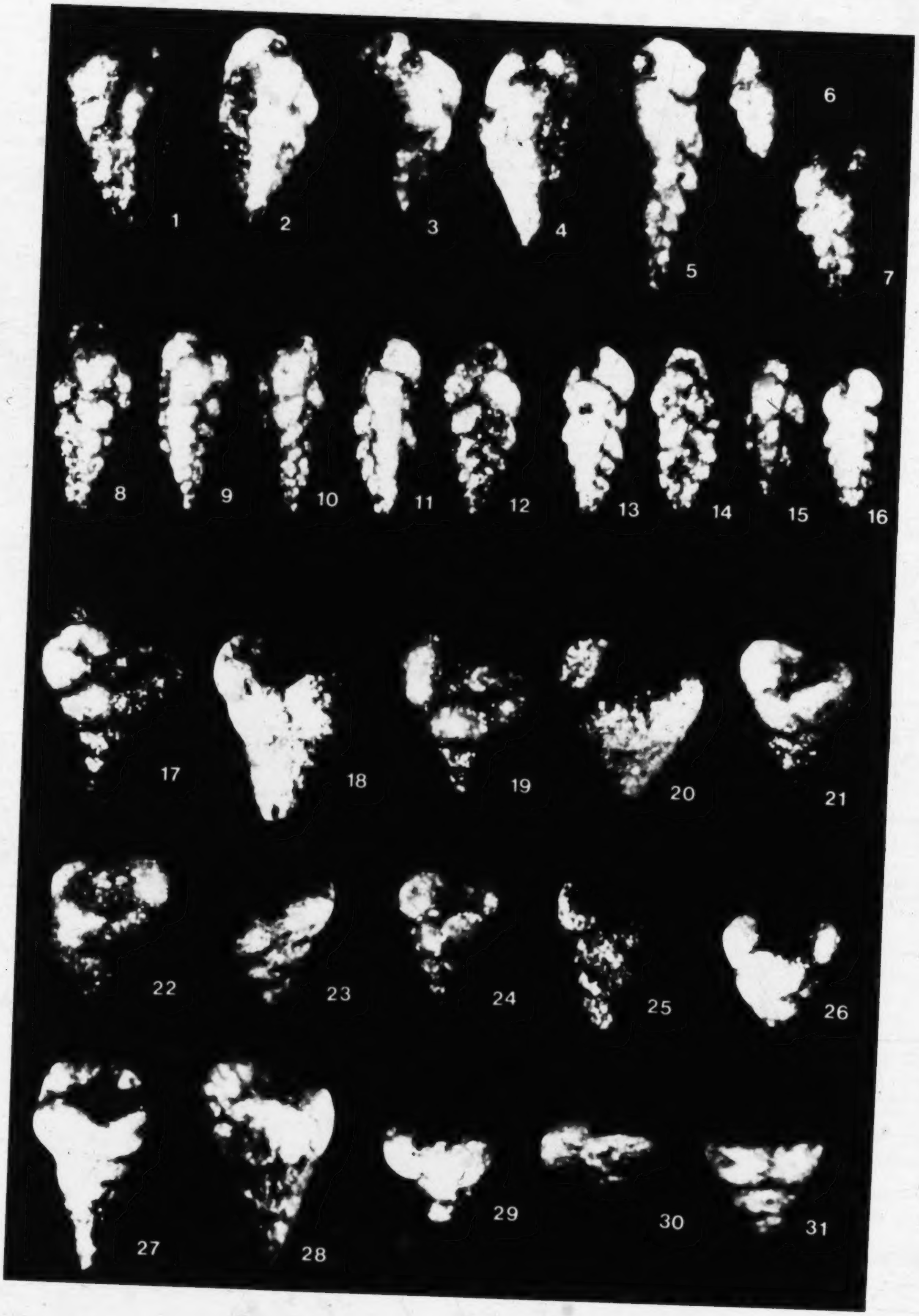
Figure		Page
26-31	*Eggerella* (*Eomarssonella*) sp. cf. *E.* (*E.*) *paraconica* Levina	234

26, 31 Figured specimen B (GSC 58121); side views of juvenile specimen.

27, 28 Figured specimen A (GSC 58120); side views of typical adult specimen. Note the sharply pointed apex of the test, and the triserial chamber arrangement in ultimate whorl.

29, 30 Figured specimen C (GSC 58122); side views.

PLATE 29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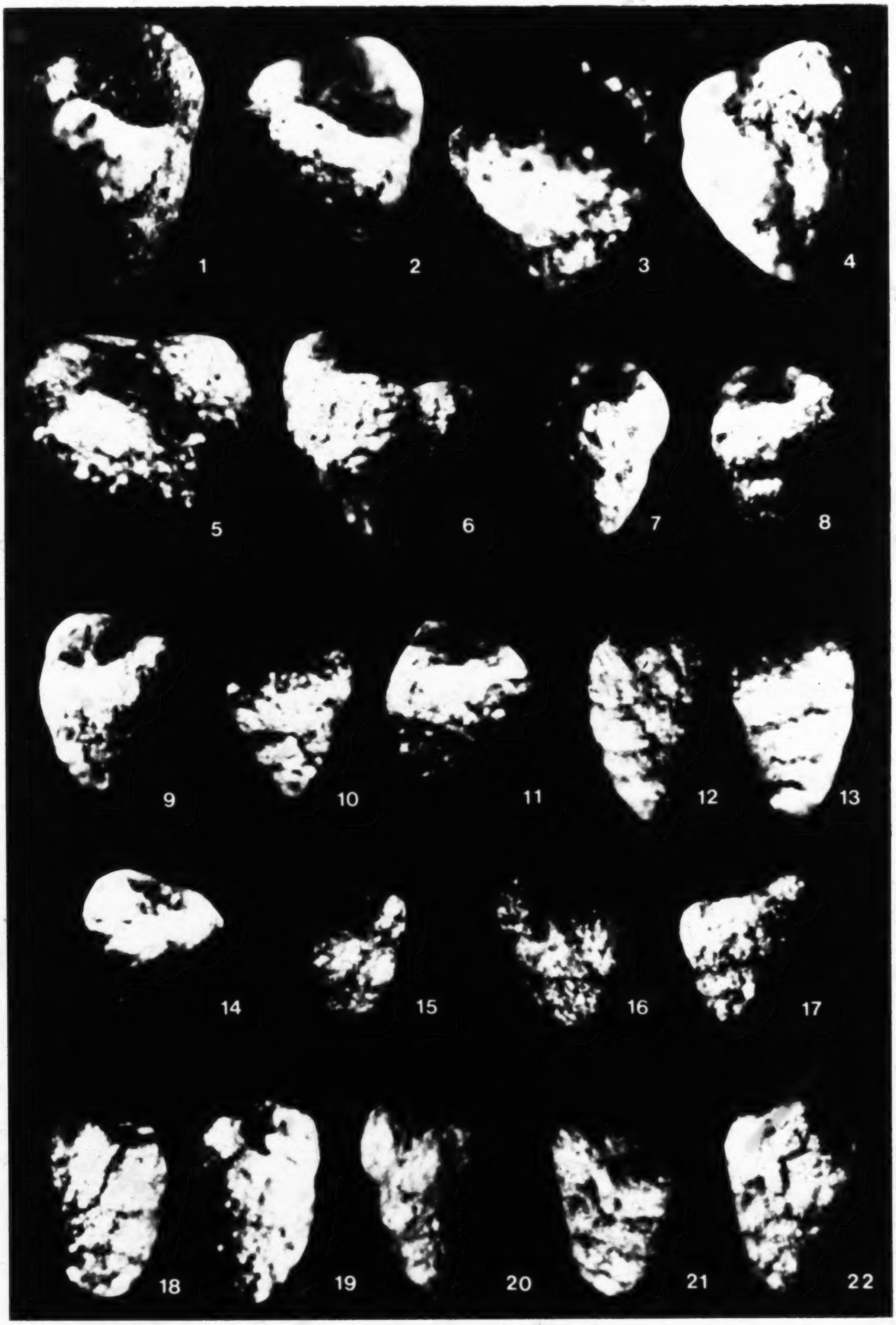
EXPLANATION OF PLATE 30

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-6	*Orientalia* sp. *6-17* subsp. *1*	237
	1, 2 Figured specimen A (GSC 58131); side view with focus adjusted twice to show entire test. Note the overall robust test nature, and the greatly inflated, quadriserially arranged ultimate whorl.	
	3 Figured specimen B (GSC 58132); side view.	
	4 Figured specimen D (GSC 58134); side view.	
	5, 6 Figured specimen C (GSC 58133); side views.	
7-13	*Orientalia* sp. *6-17*	236
	7, 8 Figured specimen D (GSC 58128); side views.	
	9, 10 Figured specimen C (GSC 58127); side views.	
	11 Figured specimen B (GSC 58126); side views.	
	12, 13 Figured specimen A (GSC 58125); side views.	
14-17	*Orientalia* sp. *6-17* subsp. *2*	239
	14, 15 Figured specimen B (GSC 58139); side views.	
	16, 17 Figured specimen C (GSC 58140); side views.	
18-22	*Eggerella* (*Eomarssonella*) *paraconica* Levina	233
	18, 19 Figured specimen A (GSC 58117); side views.	
	20 Figured specimen C (GSC 58119); side view.	
	21, 22 Figured specimen B (GSC 58118); side views.	

PLATE 30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EXPLANATION OF PLATE 31

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

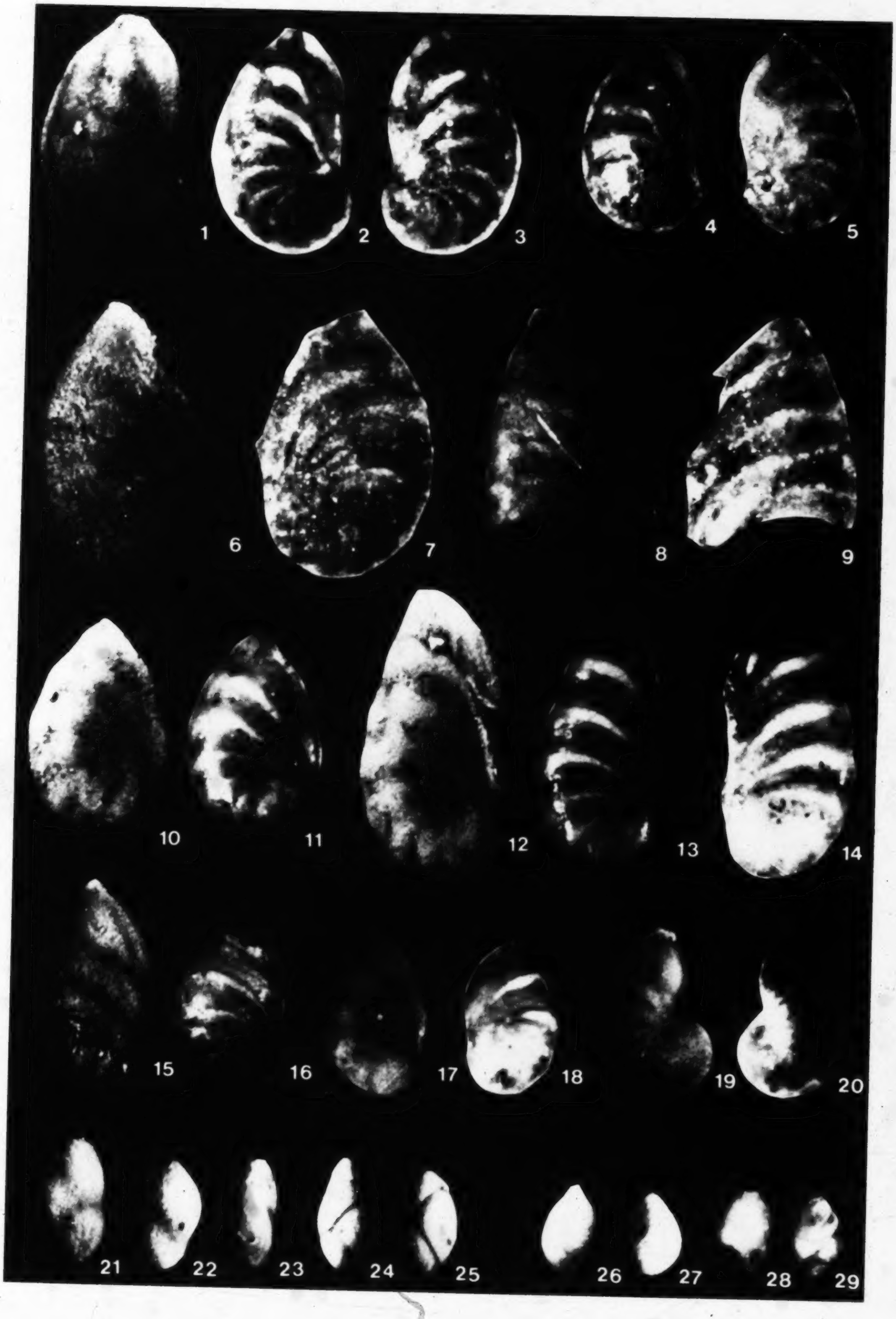
Figure		Page
1-9	Astacolus sp. cf. A. praesibirensis Kosyreva	243
	1-3 Figured specimen A (GSC 58152); opposite side views of complete specimen.	
	4, 5 Figured specimen C (GSC 58154); opposite side views.	
	6, 7 Figured specimen B (GSC 58153); opposite side views.	
	8, 9 Figured specimen D (GSC 58155); opposite side views.	
10-14, 17, 18	Astacolus sp. 6-16	244
	10, 11 Figured specimen A (GSC 58156); side views.	
	12-14 Figured specimen B (GSC 58157); opposite side views.	
	17, 18 Figured specimen C (GSC 58158); opposite side views.	
15, 16 19, 20	Astacolus sp. 5-32	245
	15, 16 Figured specimen A (GSC 58162); opposite side views.	
	19, 20 Figured specimen B (GSC 58163); opposite side views.	
21-25	Eoguttulina sp.	303
	21 Figured specimen A (GSC); side view.	
	22, 23 Figured specimen B (GSC); side and peripheral views.	
	24 Figured specimen C (GSC); side view.	
	25 Figured specimen D (GSC); side view of pyritized mold.	

EXPLANATION OF PLATE 31 (cont'd)

Figure		Page
26-29	Globulina sp.	304
	26 Figured specimen A (GSC); side view.	
	27 Figured specimen B (GSC); side view.	
	28 Figured specimen C (GSC); side view.	
	29 Figured specimen D (GSC); side view.	

Note: Geological Survey of Canada Type Numbers still to be assigned for Eoguttulina sp. and Globulina sp.

PLATE 31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EXPLANATION OF PLATE 32

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-5	Vaginulinopsis sp. 6-10	300
	1, 2 Figured specimen A (GSC 58456); opposite side views of robust adult.	
	3-5 Figured specimen B (GSC 58457); opposite side and peripheral views.	
6-10	Vaginulinopsis sp. cf. V. enodis Loeblich and Tappan .	298
	6, 7 Figured specimen B (GSC 58453); side views.	
	8, 9 Figured specimen A (GSC 58452); opposite side views.	
	10 Figured specimen C (GSC 58454); side view of juvenile specimen.	
11-14	Vaginulinopsis sp. 7-3	301
	11, 12 Figured specimen A (GSC 58462); opposite side views.	
	13, 14 Figured specimen B (GSC 58463); opposite side views.	
15-22	Saracenaria sp. cf. S. cypha Loeblich and Tappan . . .	290
	15 Figured specimen A (GSC 58428); side view.	
	16-18 Figured specimen D (GSC 58431); side and peripheral views of typical adult specimen.	
	19 Figured specimen E (GSC 58432); side view.	
	20 Figured specimen B (GSC 58429); side view.	
	21 Figured specimen C (GSC 58430); side view.	
	22 Figured specimen F (GSC 58433); side view of juvenile specimen.	

EXPLANATION OF PLATE 32 (cont'd)

Figure Page

23-27 *Saracenaria* sp. cf. *S*. *cypha* Loeblich and Tappan var. *1* 292

23-25 Figured specimen A (GSC 58434); side and peripheral views.

26, 27 Figured specimen B (GSC 58435); side and peripheral views.

28-31 *Saracenaria* sp. *7-3* 293

28, 29 Figured specimen A (GSC 58440); side and peripheral views of adult specimen.

30 Figured specimen D (GSC 58443); side view.

31 Figured specimen E (GSC 58444); side view.

32-39 *Planularia*(?) sp. *7-3* 280

32, 33 Figured specimen F (GSC 58405); opposite side views of variety in which last chambers do not reach back to the coil.

34, 35 Figured specimen A (GSC 58400); opposite side views of typical adult specimen.

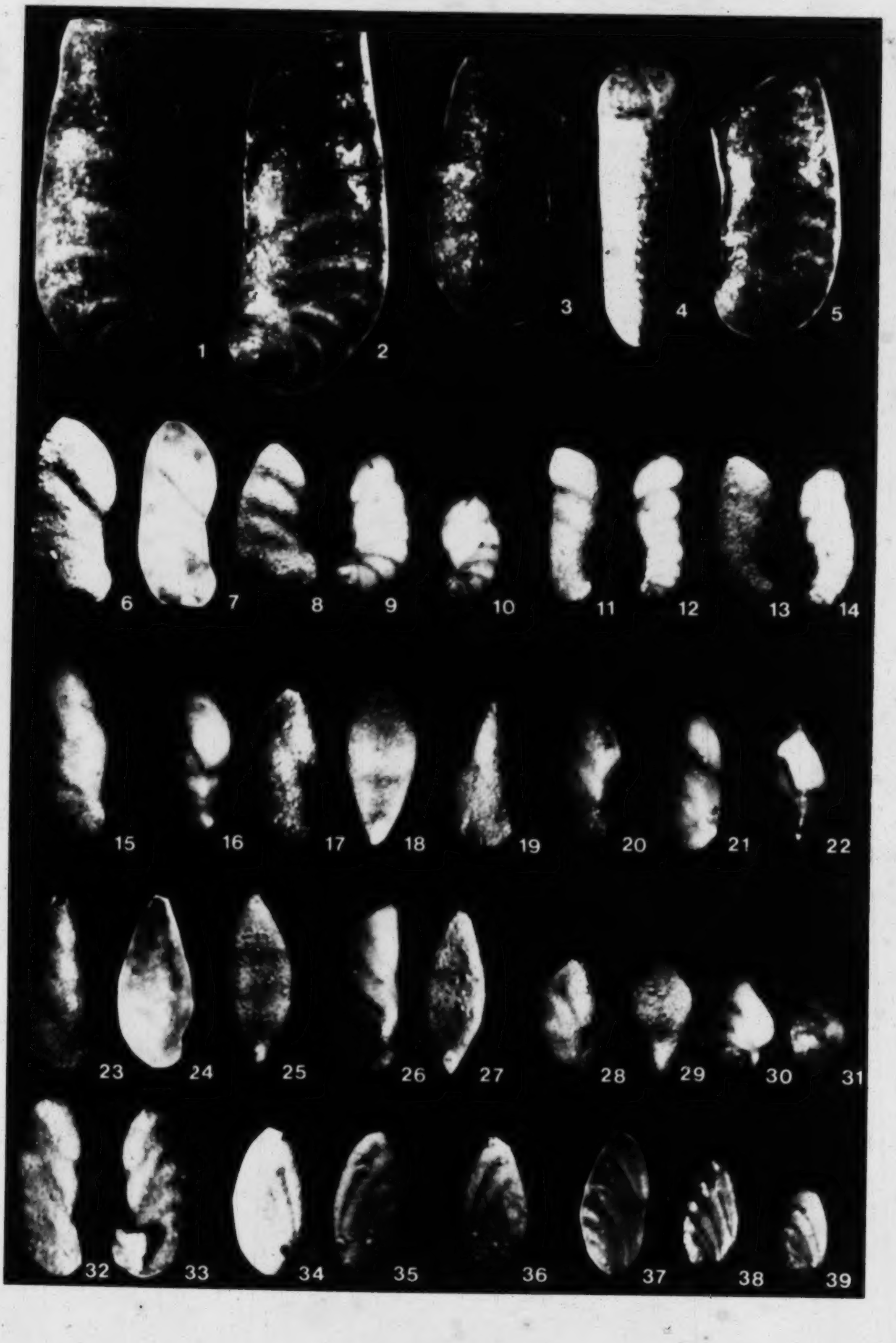
36 Figured specimen B (GSC 58401); side view.

37 Figured specimen C (GSC 58402); side view.

38 Figured specimen D (GSC 58403); side view.

39 Figured specimen E (GSC 58404); side view of a juvenile specimen.

PLATE 32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EXPLANATION OF PLATE 33

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure Page

1-7 *Citharina* sp. *5-29* 246

1, 2 Figured specimen B (GSC 58165); opposite side views of broken adult specimen.

3, 4 Figured specimen C (GSC 58166); opposite side views of fragmentary adult specimen.

5-7 Figured specimen A (GSC) 58164); opposite side and peripheral views of complete juvenile specimen.

8-10, 12-14 *Lenticulina* sp. *7-3* 266

8-10 Figured specimen B (GSC 58224); opposite side and perpheral views of slightly crushed adult specimen.

12-14 Figured apecimen A (GSC 58223); opposite side and peripheral views of typical adult specimen.

11, 24-26 *Lenticulina* sp. cf. *L. audax* Loeblich and Tappan . . 261

11 Figured specimen C (GSC 58205); side view of damaged adult test.

24. 25 Figured specimen A (GSC 58203); opposite side views.

26 Figured specimen B (GSC 58204); side view.

15, 16 19-22, 27 *Lenticulina* sp. *5-32* 264

15, 16 Figured specimen G (GSC 58221); opposite side views of uncoiling variety.

19-22 Figured specimen A (GSC 58215); opposite side and peripheral views of typical adult specimen.

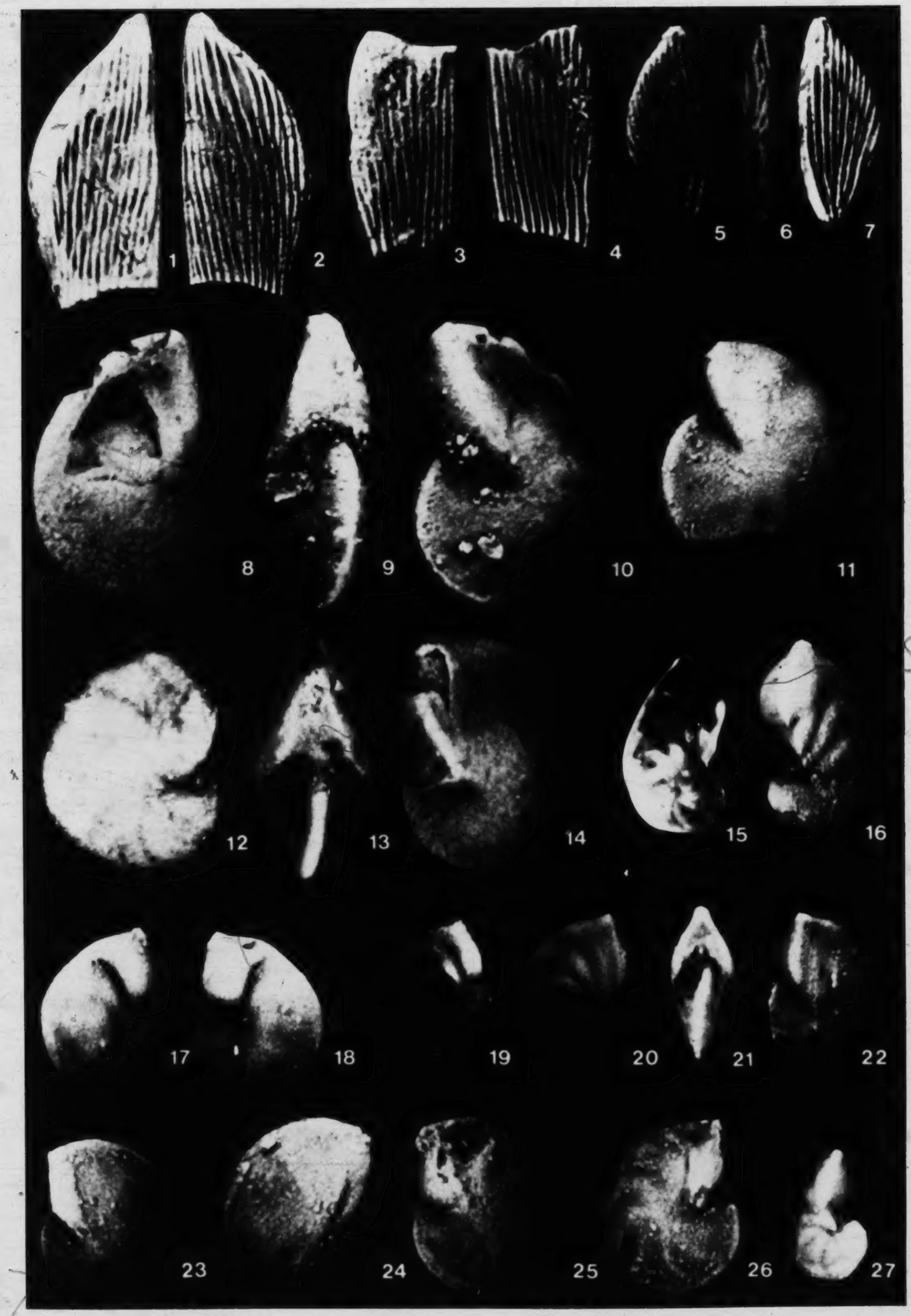
27 Figured specimen F (GSC 58220); side view of uncoiling juvenile.

17, 18 23 *Lenticulina* sp. *5-28A* . . . .

17, 18 Figured specimen A (GSC); opposite side views.

23 Figured specimen B (GSC); side view.

PLATE 33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EXPLANATION OF PLATE 34

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-4	*Lenticulina* sp. *5-29-B*	263
	1 Figured specimen A (GSC 58209); side view.	
	2, 3 Figured specimen E (GSC 58213); side views of a fragmentary specimen.	
	4 Figured specimen C (GSC 58211); side view.	
5-12	*Lenticulina gerkei* Dain	260
	5, 6 Hypotype F (GSC 58201); side views in reflected light showing the marked inflation of the last-formed chambers characteristic of this species. Magnification is 120x.	
	7 Hypotype A (GSC 58196); side view.	
	8, 9 Hypotype C (GSC 58198); opposite side views of form with *Darbyella*-like mode of coiling.	
	10 Hypotype F (GSC 58201); side view.	
	11, 12 Hypotype E (GSC 58200); opposite side views.	
13-16, 21, 22	*Pseudonodosaria* sp. *7-1*	288
	13, 14 Figured specimen A (GSC 58417); side views of coated and uncoated adult specimen.	
	15 Figured specimen B (GSC 58418); side view.	
	16 Figured specimen C (GSC 58419); side view.	
	21, 22 Figured specimen F (GSC 58422); side views of an unusually large variety.	
17	*Nodosaria* sp. *5-34*	279
	17 Figured specimen A (GSC 58399); side view.	
18-20	*Pseudonodosaria* sp. *5-28*	285
	18, 20 Figured specimen A (GSC 58413); top (apertural) and side views of adult specimen.	
	19 Figured specimen B (GSC 58414); side view of a juvenile specimen.	

EXPLANATION OF PLATE 34 (cont'd)

Figure . . . . Page

23, 24 *Nodosaria* sp. *5-28* 278

23 Figured specimen C (GSC 58398); side view.

24 Figured specimen A (GSC 58396); side view.

25, 26 *Pseudonodosaria brandi* (Tappan) 283

25 Hypotype A (GSC 58406); side view.

26 Hypotype B (GSC 58407); side view.

27 *Spirillina*(?) sp. *6-16* 315

27 Figured specimen A (GSC 58497); side view.

28, 29 *Spirillina*(?) sp. *6-25* 316

28 Figured specimen A (GSC 58498); side view of pyrite cast of typical specimen.

29 Figured specimen B (GSC 58499); side view of pyrite cast of fragmented specimen.

30, 31 *Pseudonodosaria* sp. *6-24* 287

30 Figured specimen B (GSC 58416); side view.

31 Figured specimen A (GSC 58415); side view.

32, 33 *Ichtyolaria*(?) sp. *29131* 259

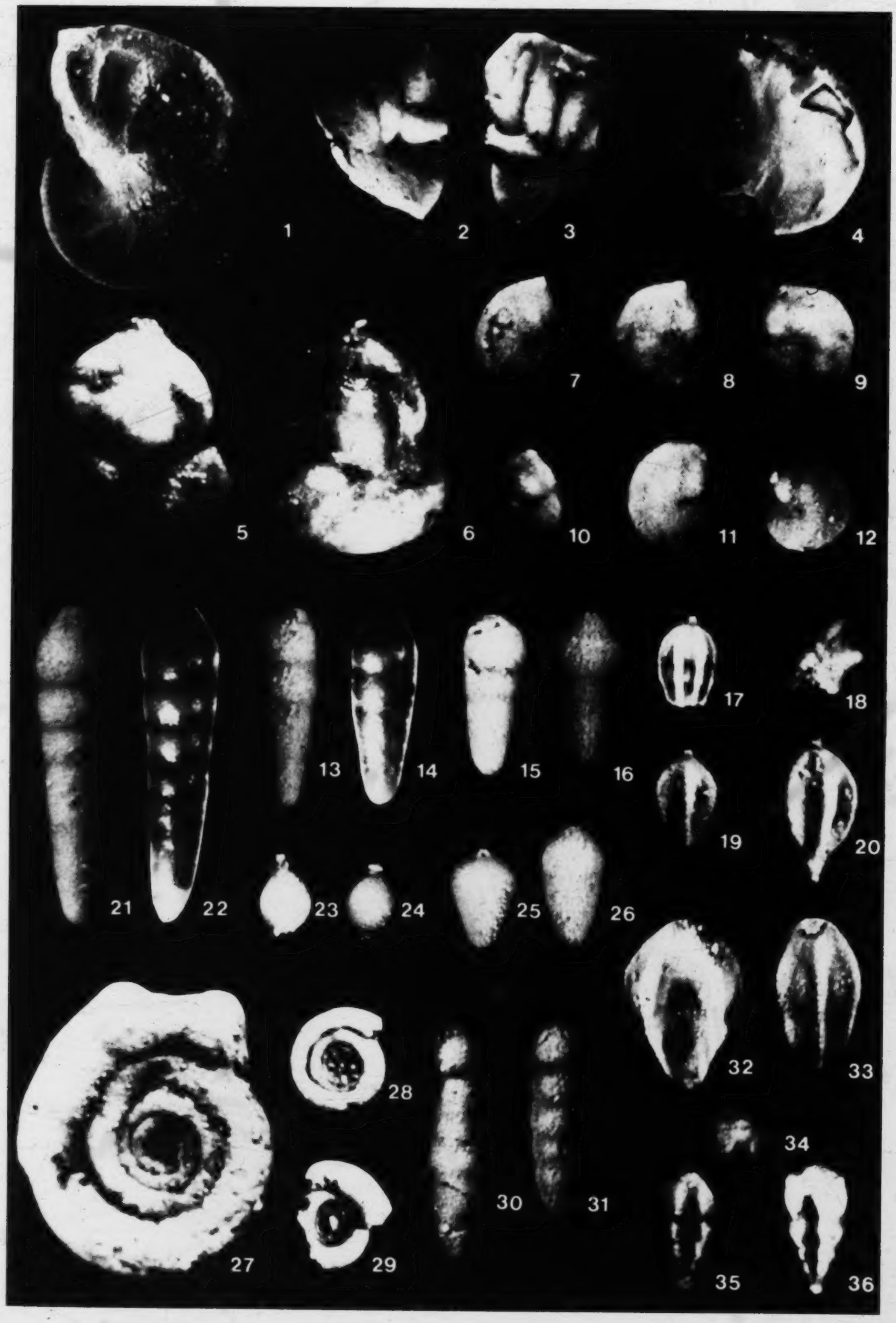
32, 33 Figured specimen A (GSC 58195); side and peripheral views.

34-36 *Geinitzinita praenodulosa* Dain 257

34, 35 Hypotype A (GSC 58191); top (apertural) and side views of small adult specimen.

36 Hypotype B (GSC 58192); side view of damaged adult.

PLATE 34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EXPLANATION OF PLATE 35

All specimens are illustrated at a magnification of approximately 40x unless otherwise stated.

Figure		Page
1-3	*Marginulinopsis* sp. *6-21* subsp. *1*	272
	1, 2 Figured specimen B (GSC 58381); opposite side views of adult specimen. Magnification 60x.	
	3 Figured specimen A (GSC 58380); side view. Magnification 60x.	
4-8	*Marginulinopsis* sp. *6-21*	270
	4 Figured specimen F (GSC 58376); side view of damaged, robust adult specimen. Magnification 60x.	
	5, 6 Figured specimen A (GSC 58371); opposite side views of typical adult specimen. Magnification 60x.	
	7, 8 Figured specimen H (GSC 58378); opposite side views. Magnification 60x.	
9-11	*Dentalina* sp. *5-28*	250
	9, 10 Figured specimen A (GSC 58177); side and peripheral views of complete specimen.	
	11 Figured specimen B (GSC 58178); side view of fragmentary specimen.	
12, 13	*Dentalina* sp. *5-30*	253
	12, 13 Figured specimen A (GSC 58506); opposite side views.	
14	*Dentalina* sp. *7-3*	253
	14 Figured specimen A (GSC 58509); side view.	
15, 16	*Dentalina* sp. *5-29*	251
	15 Figured specimen A (GSC 58179); side view.	
	16 Figured specimen B (GSC 58180); side view.	
17, 18	*Dentalina* sp. *5-32-2*	256
	17, 18 Figured specimen A (GSC 58189); side and peripheral views.	

EXPLANATION OF PLATE 35 (cont'd)

Figure Page

19-24 *Dentalina* sp. *5-32-1* 255

19, 20 Figured specimen A (GSC 58183); side views of coated and uncoated, five chambered, adult specimen.

21 Figured specimen E (GSC 58187); side view.

22-24 Figured specimen B (GSC 58184); opposite side and peripheral views of a juvenile specimen.

25, 26 *Marginulina* sp. cf. *M*. *breviformis* (Terquem and Berthelin) 269

25 Figured specimen A (GSC 58368); side view.

26 Figured specimen B (GSC 58369); side view.

27, 28 *Dentalina* sp. cf. *D*. *ejuncida* Loeblich and Tappan . . 249

27 Figured specimen A (GSC 58174); side view of adult specimen. Magnification 120x.

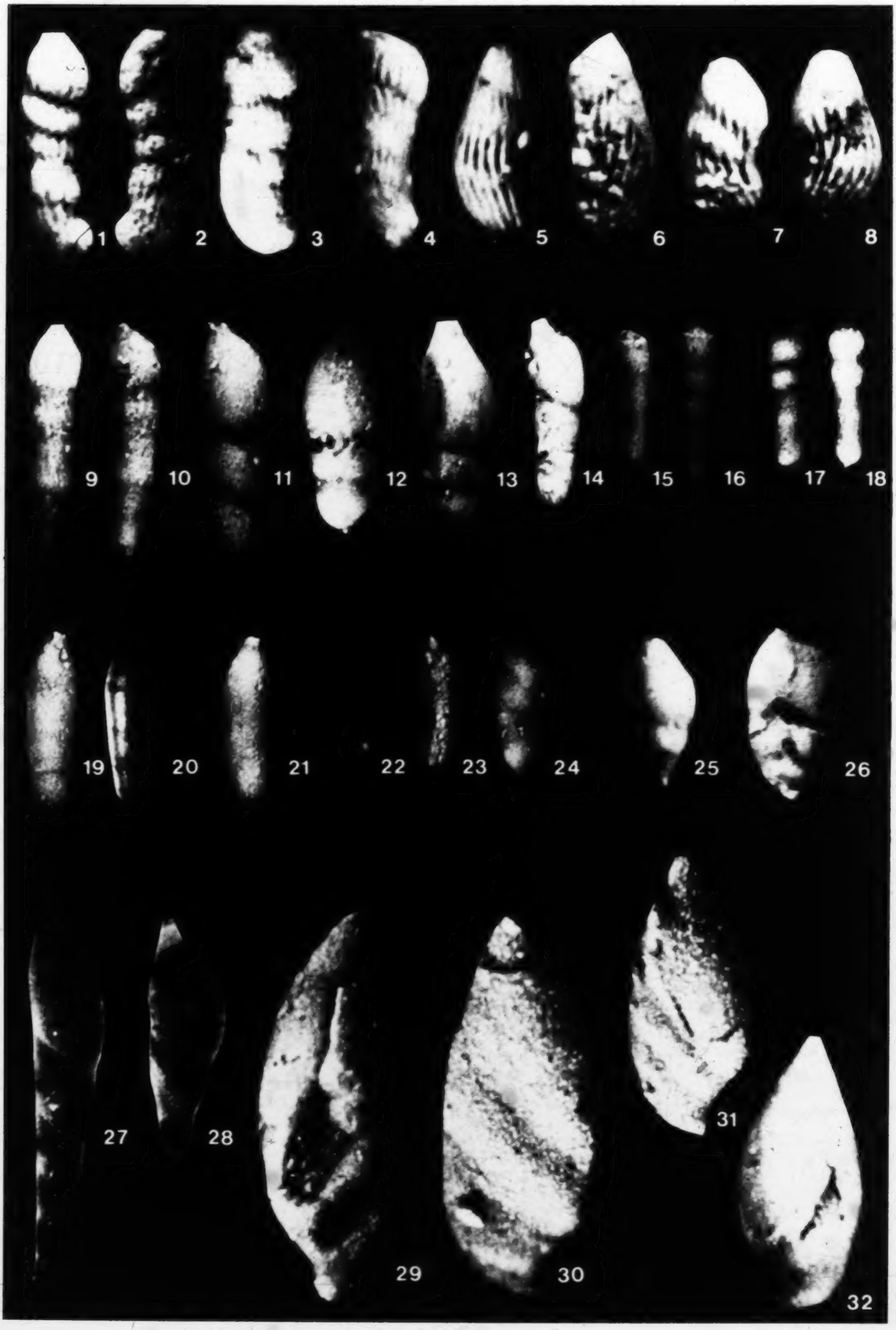
28 Figured specimen C (GSC 58176); side view of juvenile specimen. Magnification 120x.

29-32 *Marginulina* *brevis* Paalzow 267

29, 30 Hypotype A (GSC 58365); opposite side views of adult specimen. Magnification 120x.

31, 32 Hypotype B (GSC 58366); opposite side views of adult specimen. Magnification 120x.

PLATE 35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EXPLANATION OF PLATE 36

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure | Page

1-6 *Citharina* sp. *5-32* 248

1, 2 Figured apecimen A (GSC 58169); opposite side views of adult specimen.

3, 4 Figured specimen B (GSC 58170); opposite side views of juvenile specimen.

5, 6 Figured specimen C (GSC 58171); opposite side views of adult specimen.

7, 8 *Tristix* (sensu lato) sp. *6-20* 307

7 Figured specimen A (GSC 58467); side view of adult specimen.

8 Figured specimen B (GSC 58468); side view of juvenile specimen.

9, 10 *Pseudonodosaria*(?) sp. aff. *P. quinquecostata* Bornemann 284

9, 10 Figured specimen A (GSC 58412); side and peripheral views.

11, 12 *Tristix* sp. cf. *T. inornata* (Loeblich and Tappan) . . 306

11, 12 Figured specimen A (GSC 58466); side views of uncoated and coated specimen.

13, 14 *Nodosaria orthostoecha* Loeblich and Tappan 276

13 Hypotype B (GSC 58391); side view.

14 Hypotype A (GSC 58390); side view of adult form.

15 *Nodosaria* sp. cf. N. *amphigya* Loeblich and Tappan . . 277

15 Figured specimen A (GSC 58395); side view.

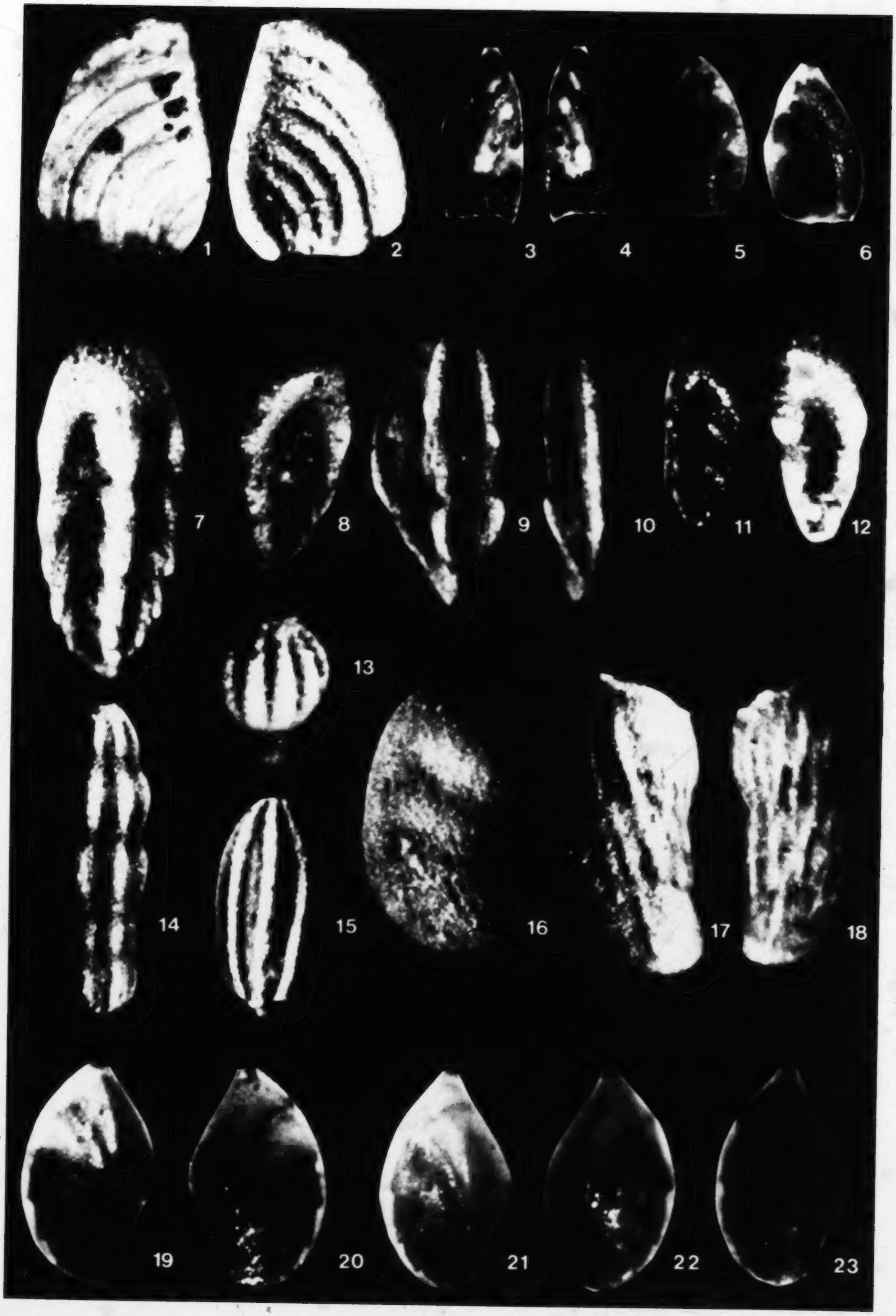
16 *Marginulinopsis* sp. *5-32* 275

16 Figured specimen A (GSC 58385); side view.

EXPLANATION OF PLATE 36 (cont'd)

Figure		Page
17, 18	Marginulinopsis sp. 5-28	274
	17, 18 Figured specimen A (GSC 58389); opposite side views of poorly preserved specimen.	
19-23	Saracenaria phaedra Tappan	289
	19, 20 Hypotype E (GSC 58427); opposite side views. 21, 22 Hypotype D (GSC 58426); opposite side views. 23 Hypotype C (GSC 58425); side view.	

PLATE 36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EXPLANATION OF PLATE 37

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure Page

1-4 *Saracenaria phaedra* Tappan 289

1, 2 Hypotype A (GSC 58423); side views of a large adult specimen.

3, 4 Hypotype B (GSC 58424); side views.

5, 6 *Saracenaria* sp. *5-28* 295

5 Figured specimen A (GSC 58446); side view of a robust adult specimen.

6 Figured specimen B (GSC 58447); side view.

7, 8 *Saracenaria* sp. cf. *S. phaedra* Tappan 297

7 Figured specimen A (GSC 58450); side view of adult specimen. Note the inflated and swollen ultimate chamber.

8 Figured specimen B (GSC 58451); side view.

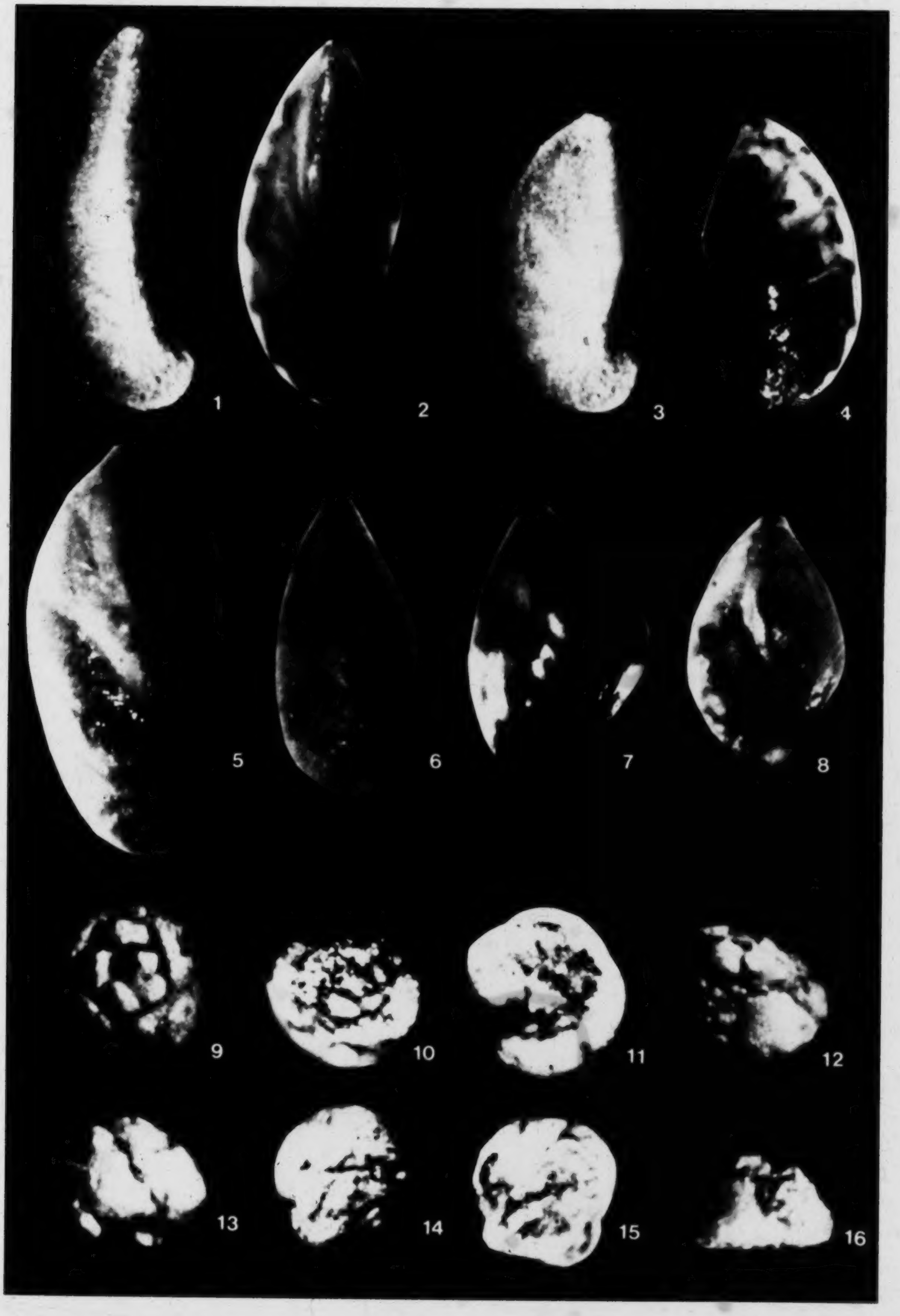
9-16 *Conorboides* sp. 5-29 311

9, 13 Figured specimen A (GSC 58477); dorsal and side views.

10-12 Figured specimen B (GSC 58478); dorsal, ventral and side views.

14-16 Figured specimen C (GSC 58479); dorsal, ventral and side views.

PLATE 37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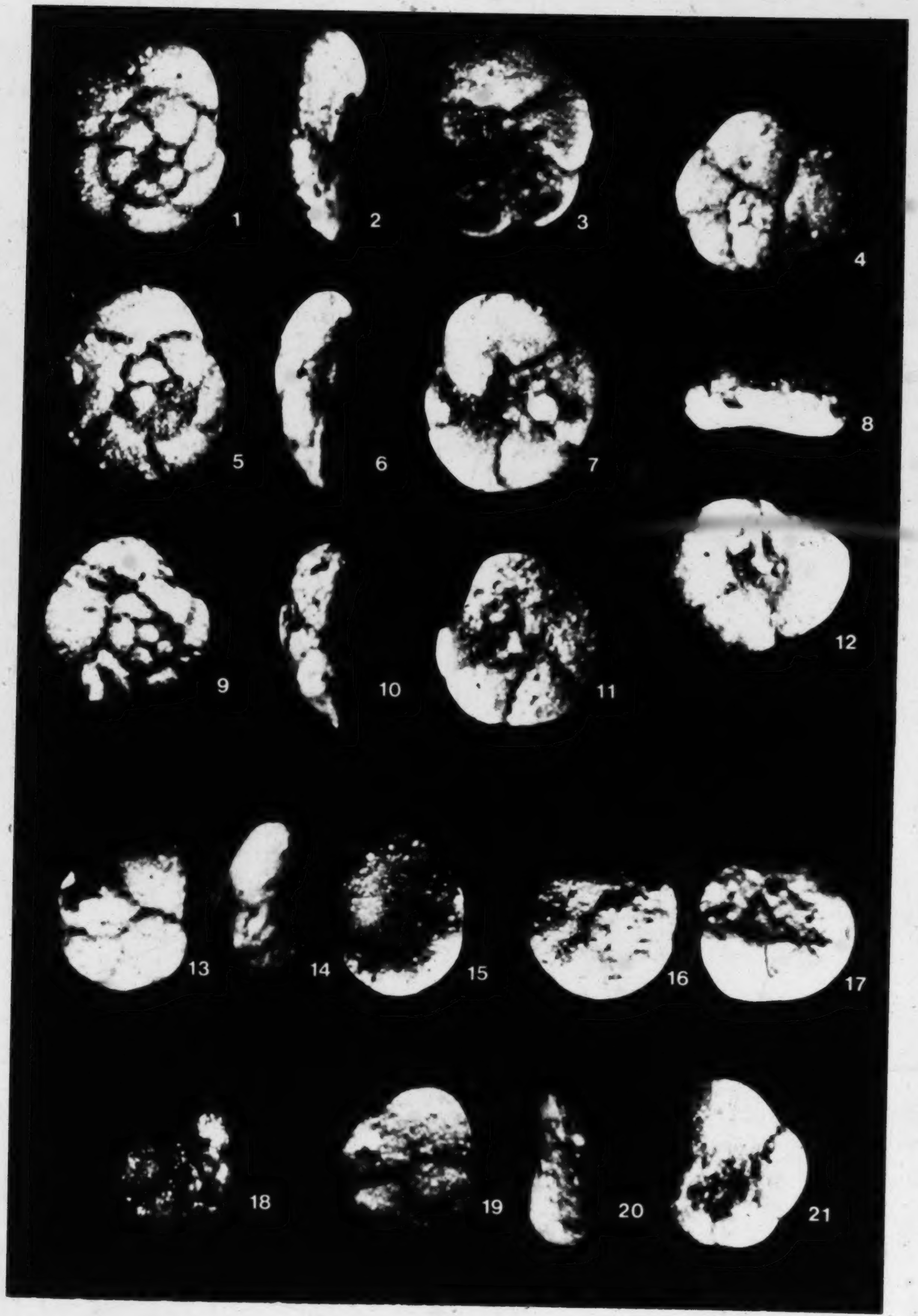
EXPLANATION OF PLATE 38

All specimens are illustrated at a magnification of approximately 120x unless otherwise stated.

Figure		Page
1-3, 5-7, 9-11	*Pseudolamarckina* sp. cf. *P. liapinensis* Dain	313
	1-3 Figured specimen A (GSC 58485); dorsal, side and ventral views of completely pyritized adult specimen.	
	5-7 Figured specimen B (GSC 58486); dorsal, side and ventral views of completely pyritized, slightly damaged specimen.	
	9-11 Figured specimen D (GSC 58488); dorsal, side and ventral views of completely pyritized specimen.	
4, 8, 12-21	*Ceratocancris* sp. cf. *C. ambitiosus* Dain	310
	4, 8, 12 Figured specimen A (GSC 58469); dorsal, side and ventral views of adult specimen.	
	13-15 Figured specimen B (GSC 58470); dorsal, side and ventral views.	
	16, 17 Figured specimen C (GSC 58471); dorsal and ventral views.	
	18-21 Figured specimen E (GSC 58473); dorsal (2), side and ventral views.	

PLATE 38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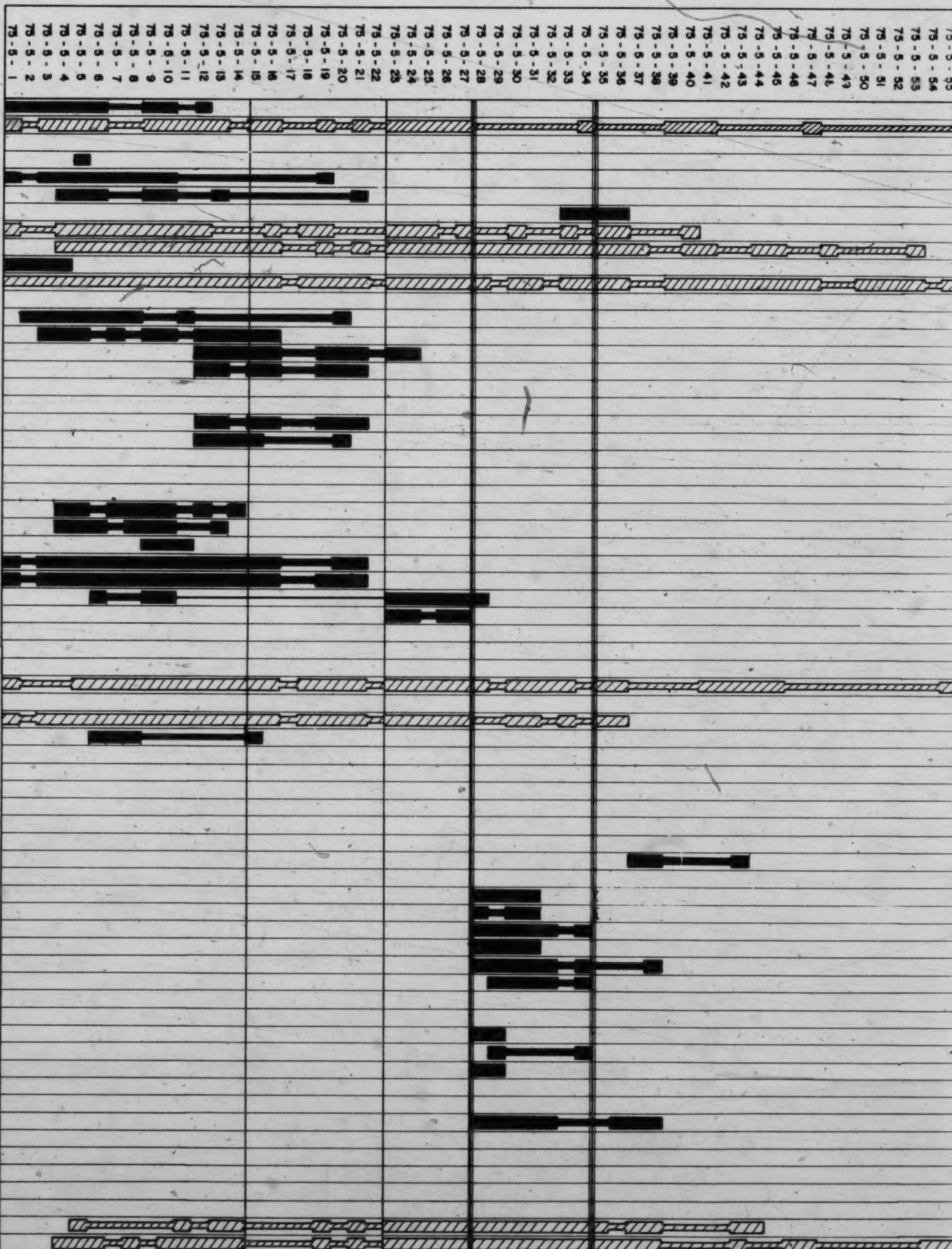
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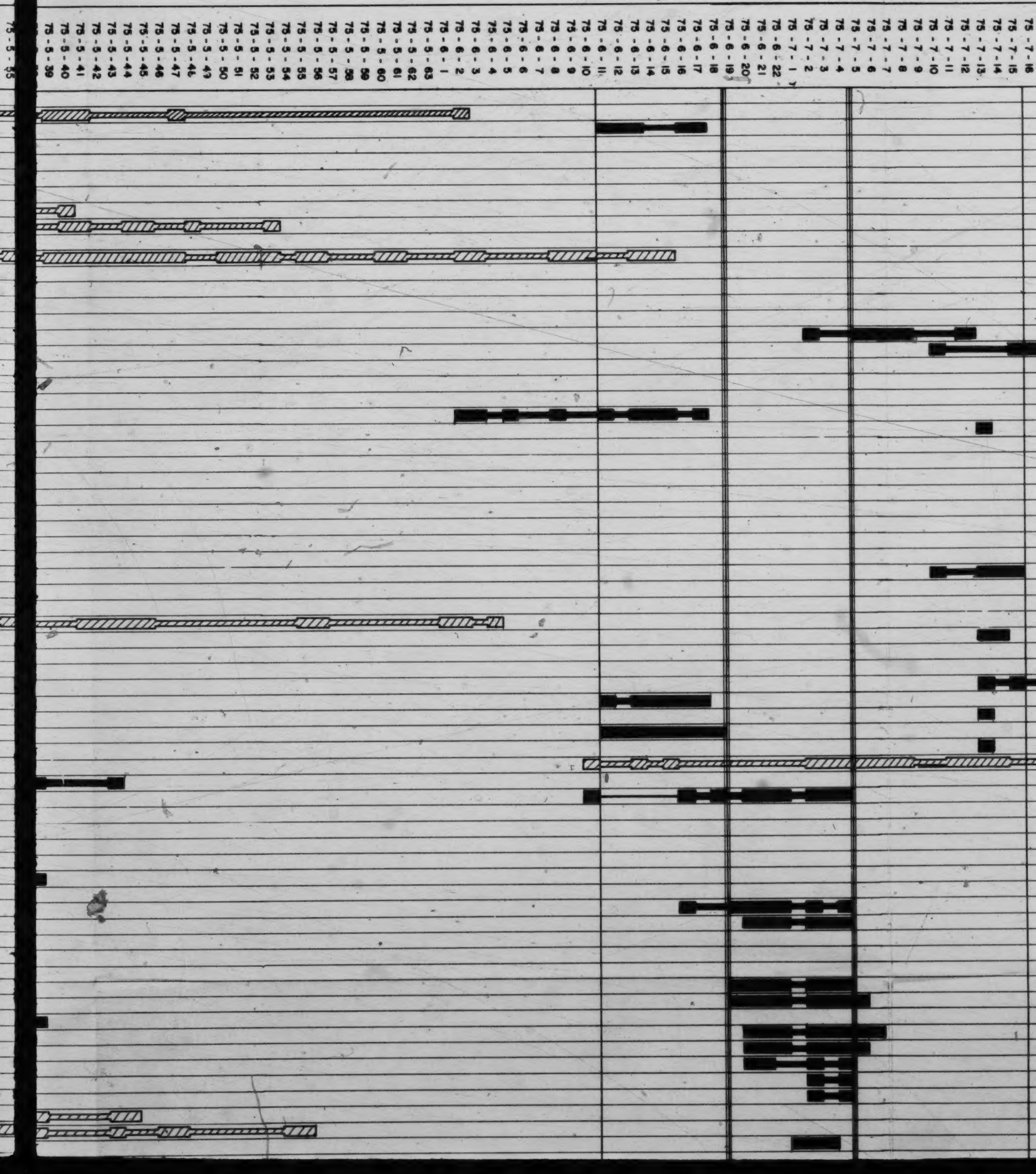
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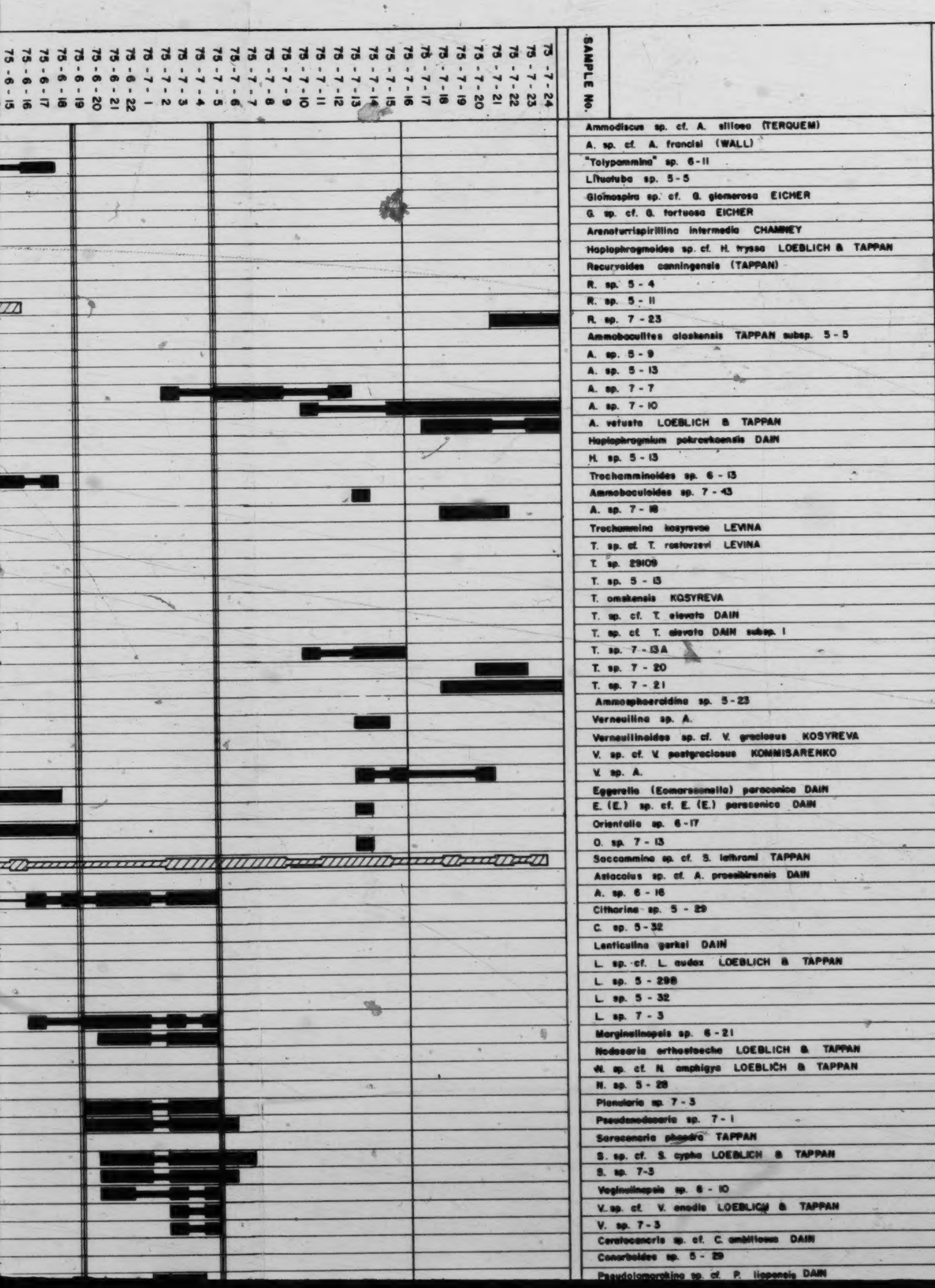
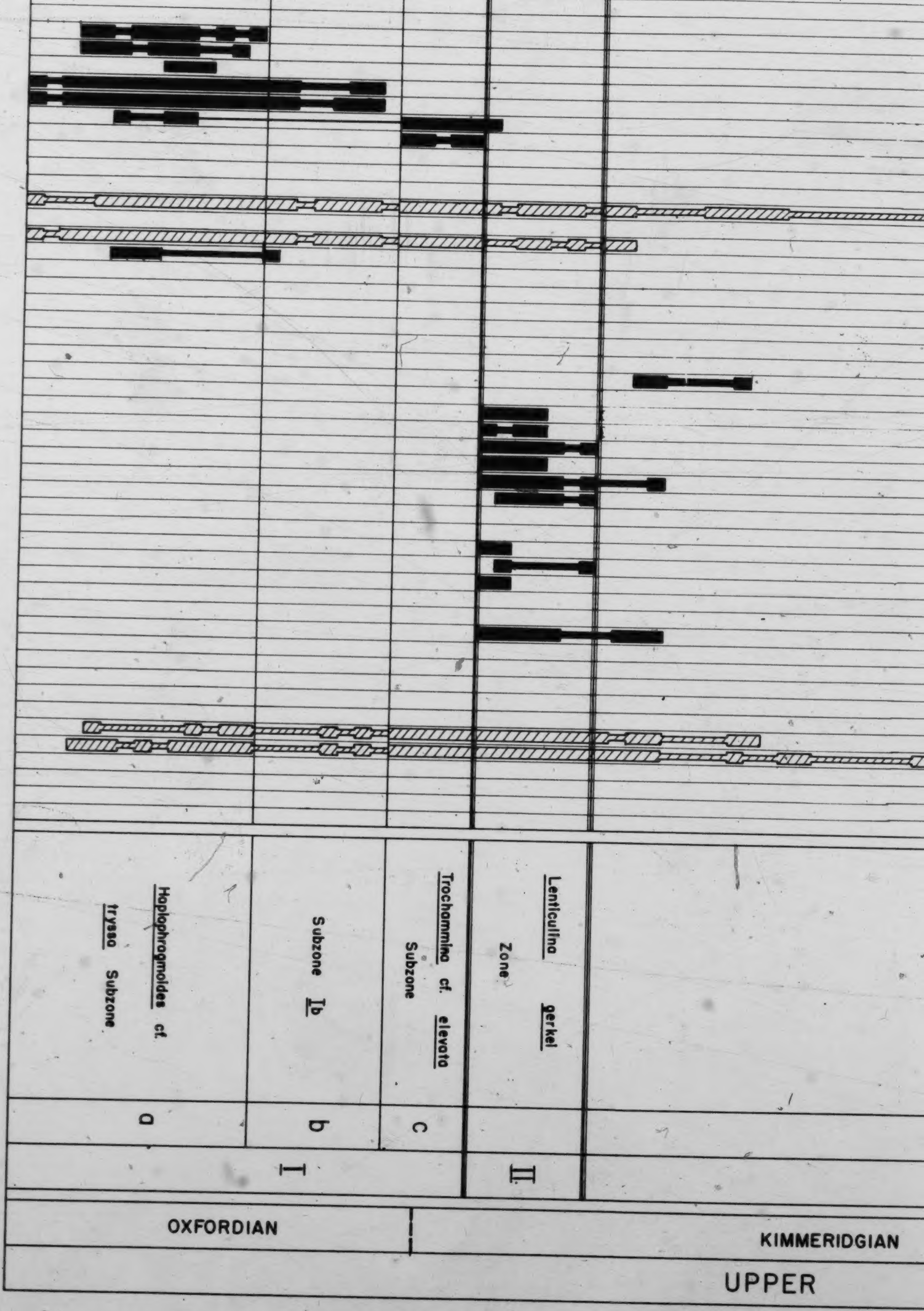


FIGURE 14: Foraminiferal Zonation of the Lower Member, Husky Formation — Vertical Ranges


Lenticulina gerkei Zone
Trochammina cf. elevata Subzone
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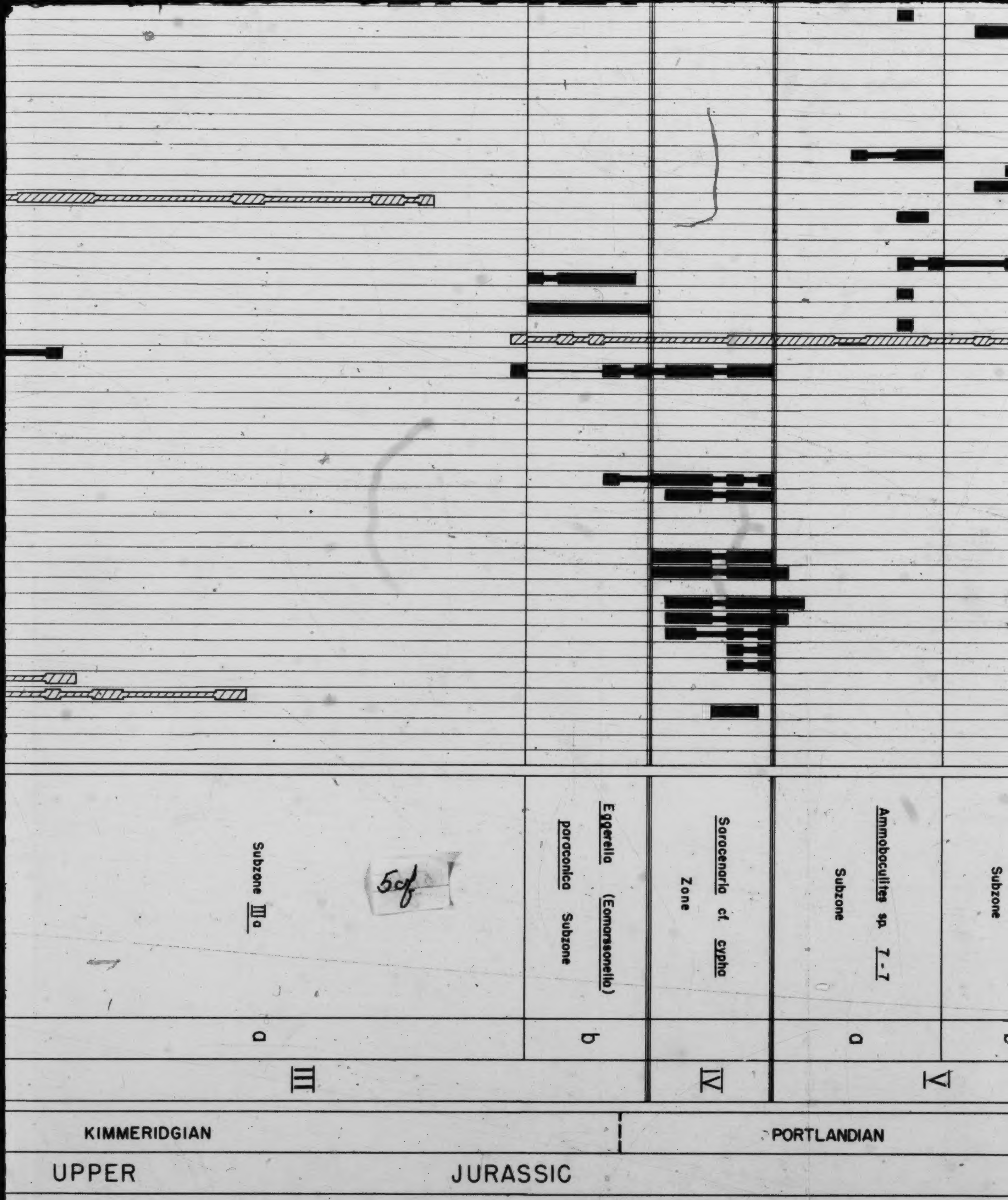
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ation of the Lower Member, Husky Formation — Vertical Ranges of Selected Species

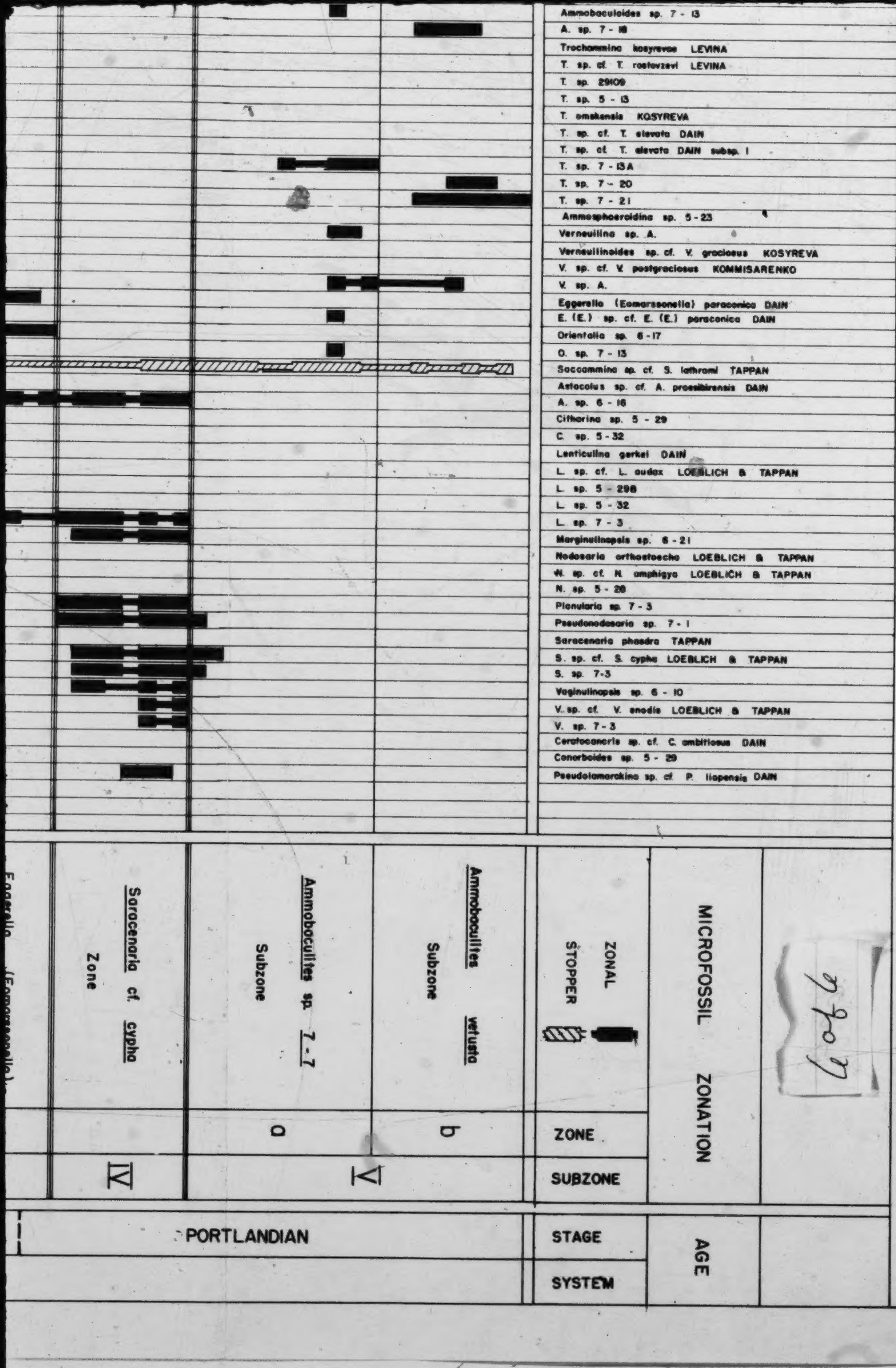


FIGURE 10a

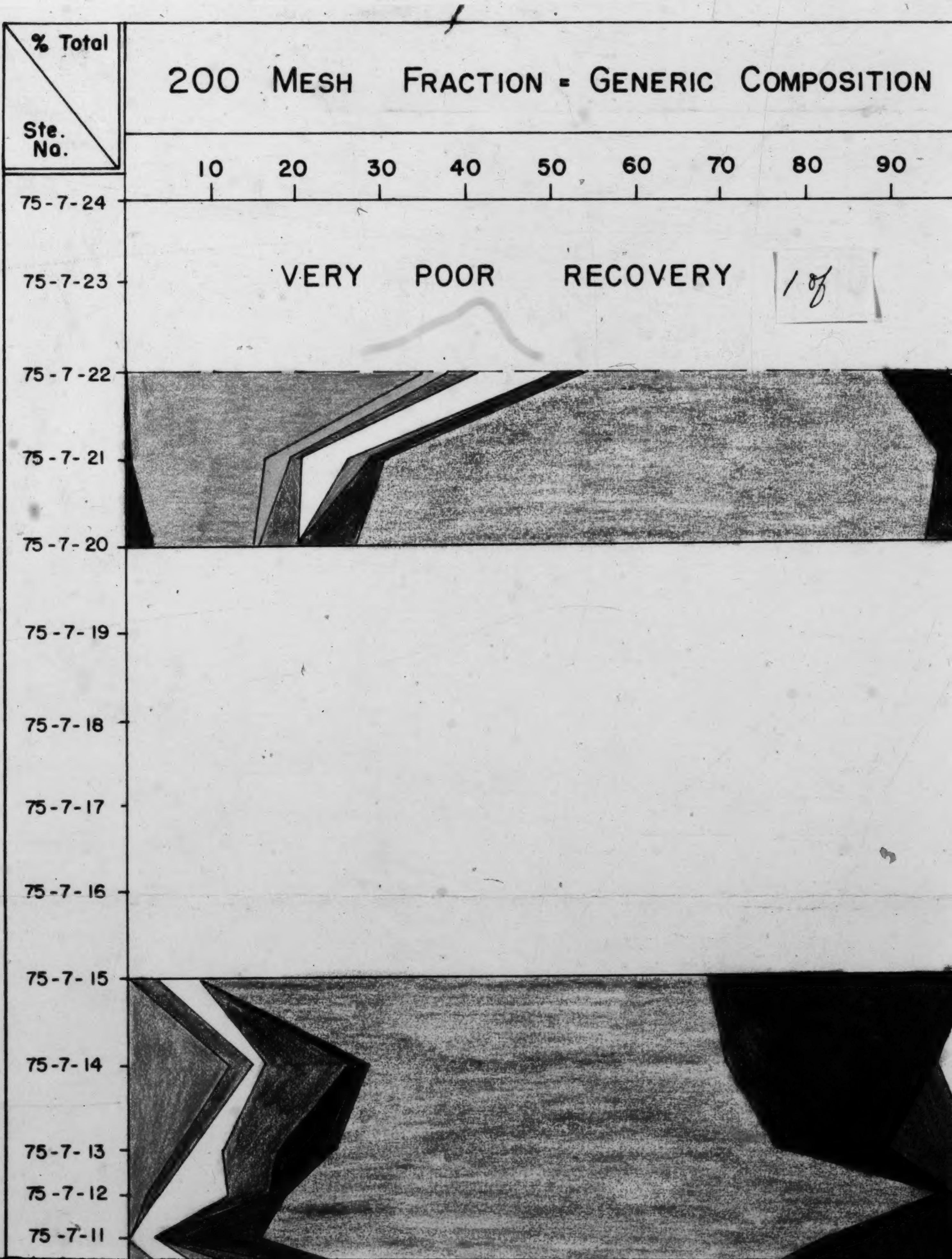
CONSOLIDATED LEGEND
for
FIGURES 10, 11, 12 & 13

ARENACEOUS (AGGLUTINATED) GENERA

- ■ **SACCAMMINA**
- ■ **BATHYSIPHON**
- ▨ **AMMODISCUS**
- ▩ **"TOLYPAMMINELLA"**
- ▒ **ARENOTURRISPIRILLINA**
- ░ **GLOMOSPIRA, LITUOTUBA, TURRITELLELLA**
- ▩ **REOPHAX**
- □ **CRIBROSTOMOIDES, HAPLOPHRAGMOIDES**
- ▒ **RECURVOIDES**
- ▩ **AMMOBACULITES, HAPLOPHRAGMIUM**
- ■ **AMMOBACULOIDES**
- ▩ **SPIROPLECTAMMINA, TEXTULARIA, Other biserials**
- ▩ **TROCHAMMINA**
- ■ **VERNEUILINA, VERNEUILINOIDES**
- ■ **EGGERELLA (EOMARSSONELLA), ORIENTALIA**

CALCAREOUS GENERA

□ **DUE TO THEIR RELATIVE SCARCITY, CALCAREOUS FORAMINIFERS ARE NOT BROKEN DOWN INTO TAXA, BUT REPRESENTED AS A SINGLE UNIT DIRECTLY FOLLOWING THE LAST ARENACEOUS TAXON IN A GIVEN SUITE.**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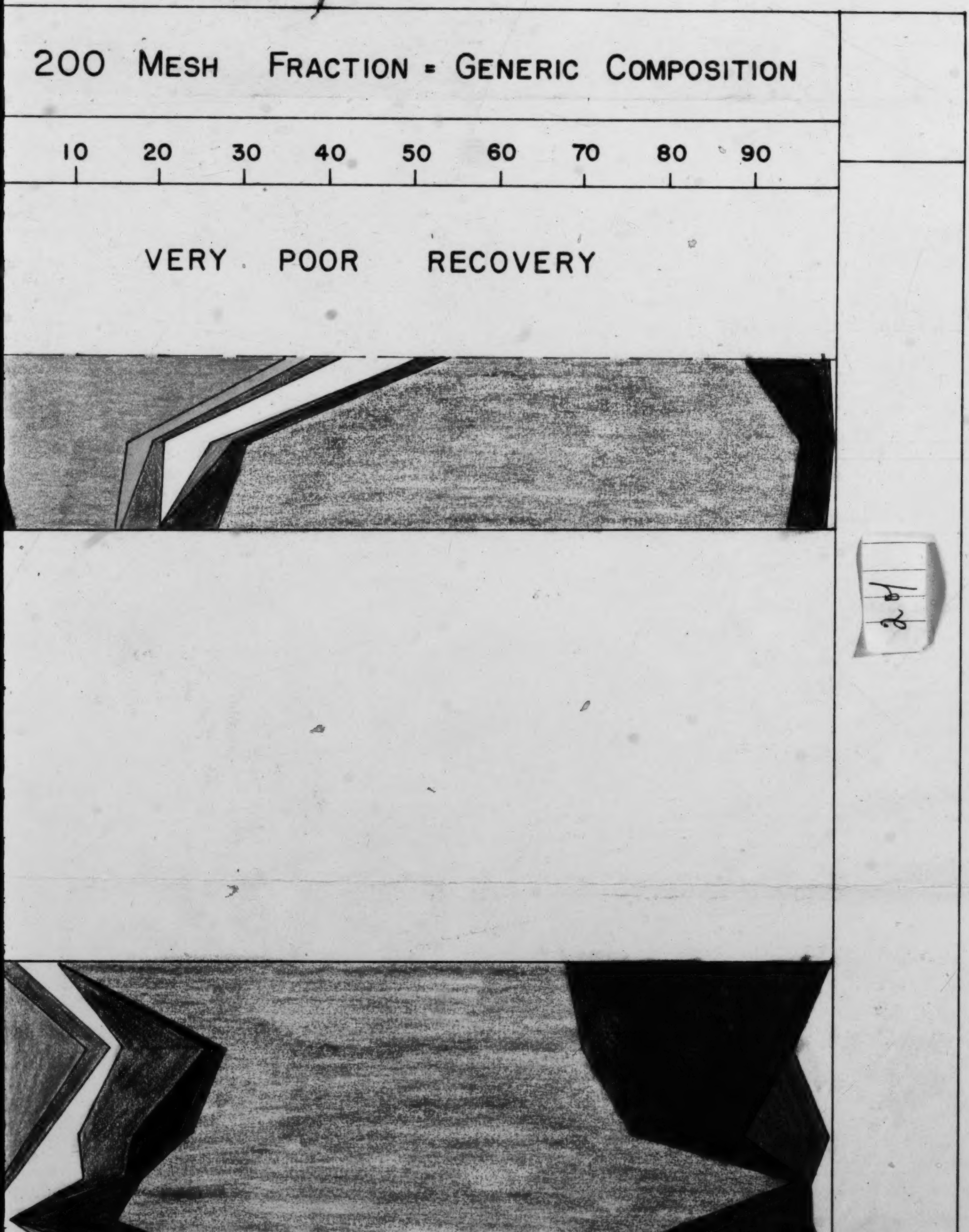
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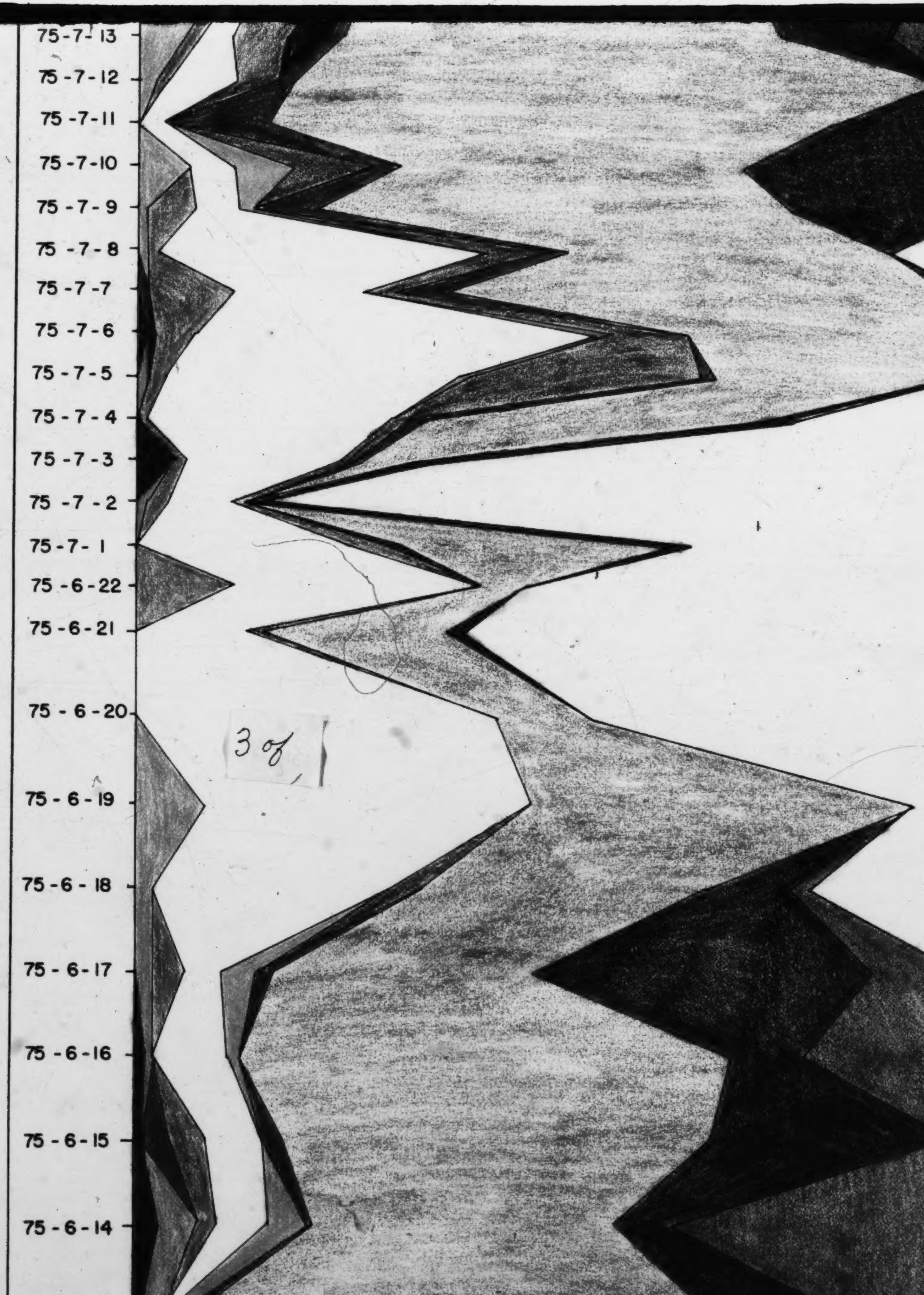
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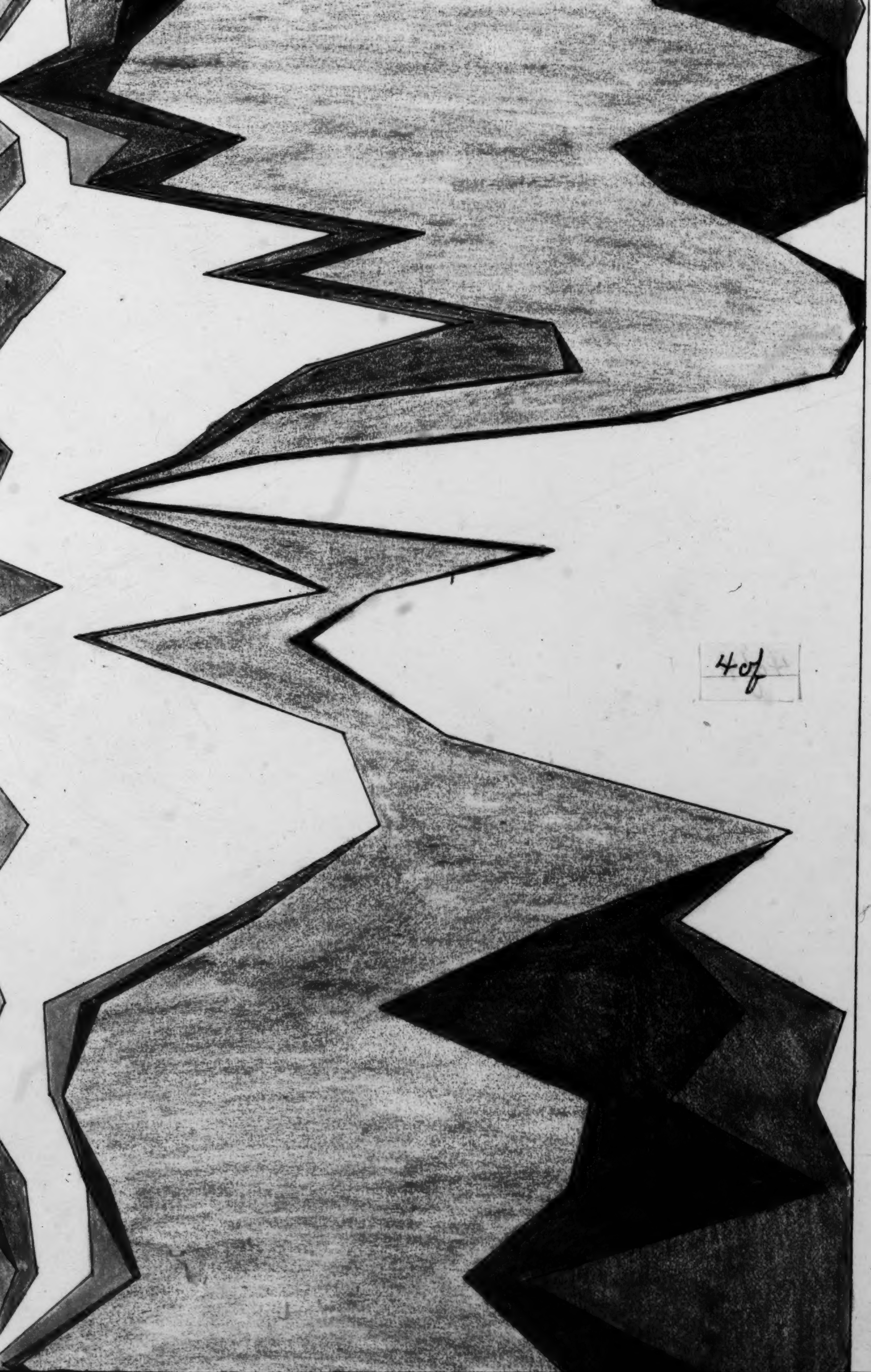

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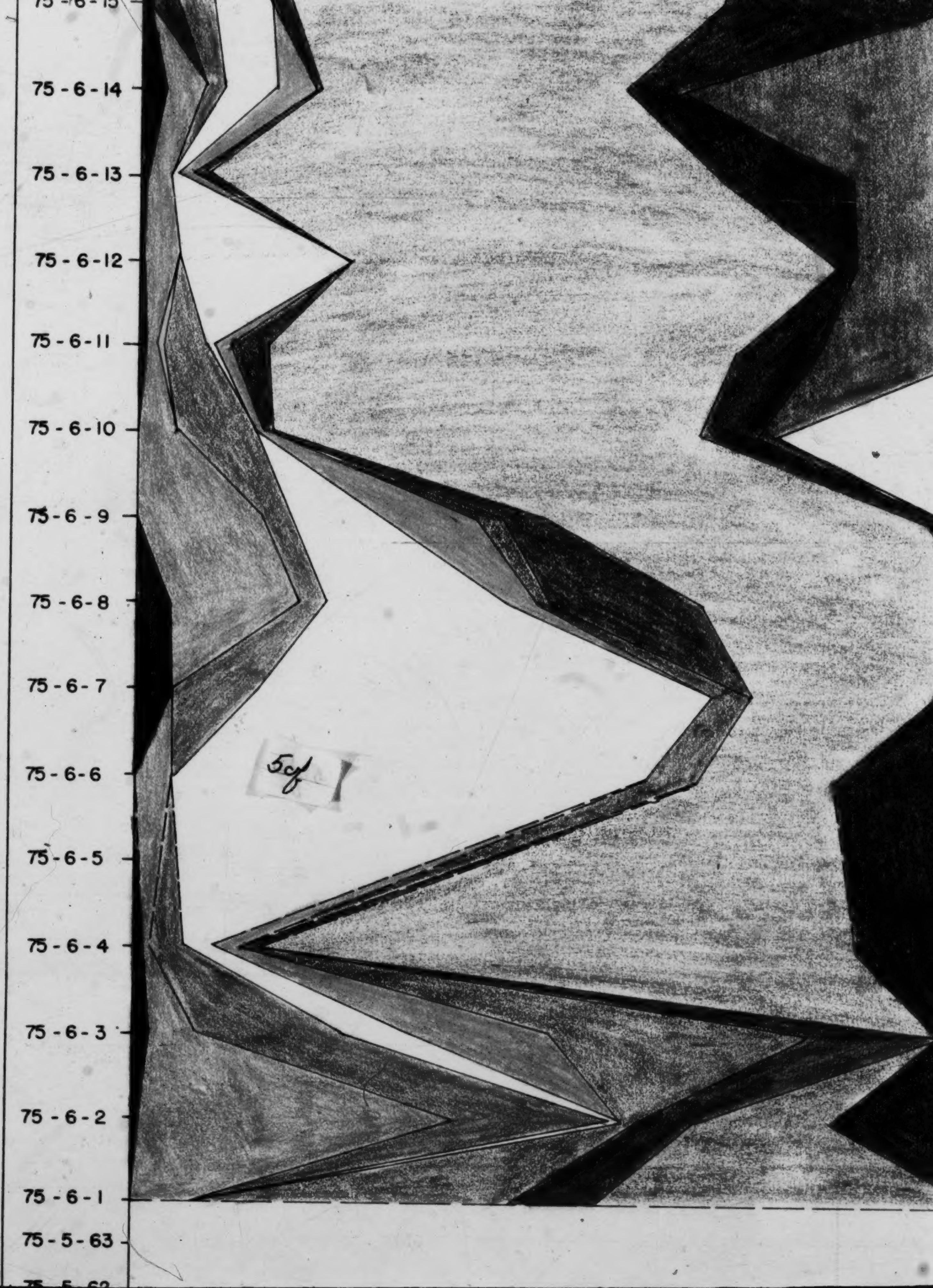
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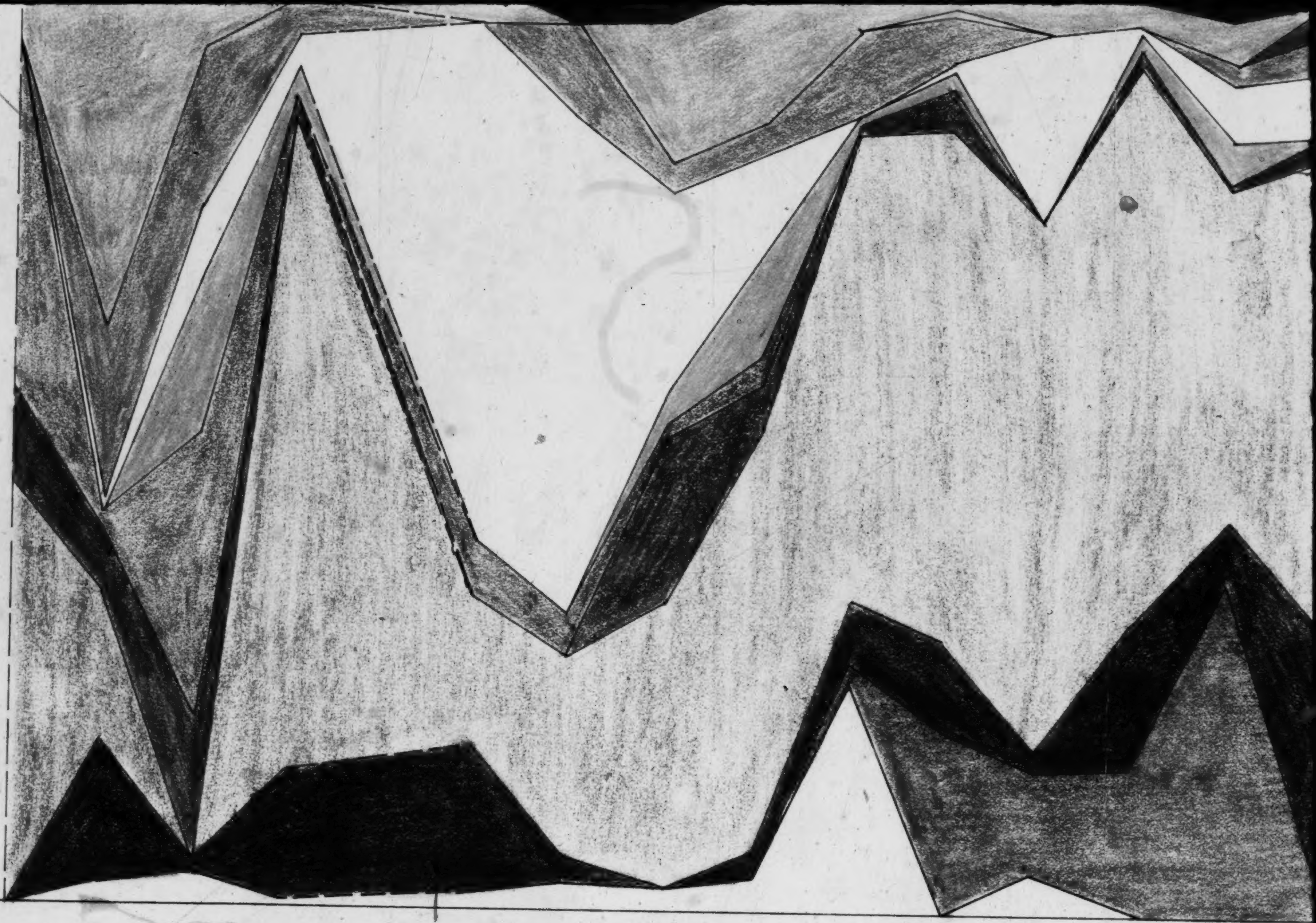

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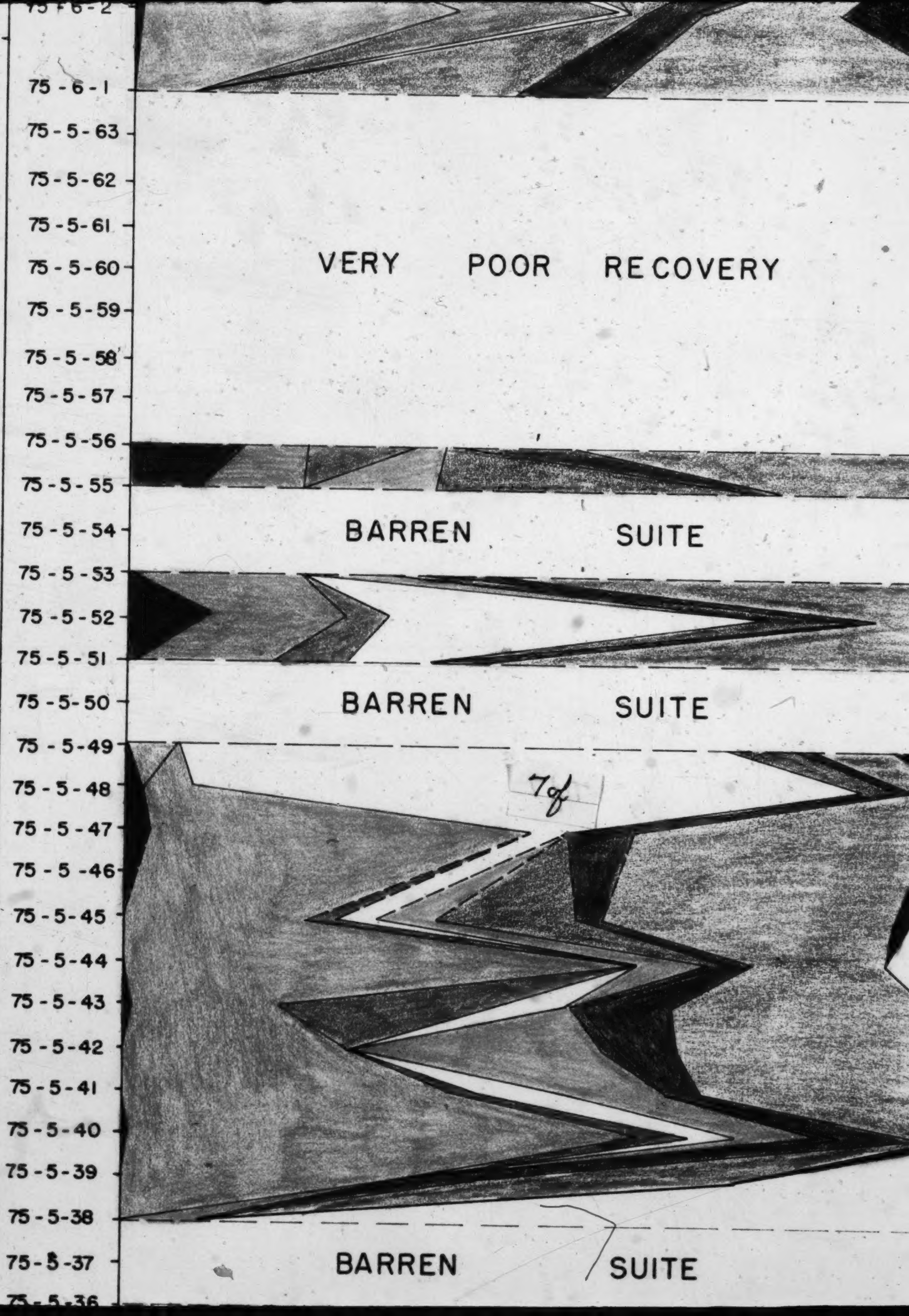
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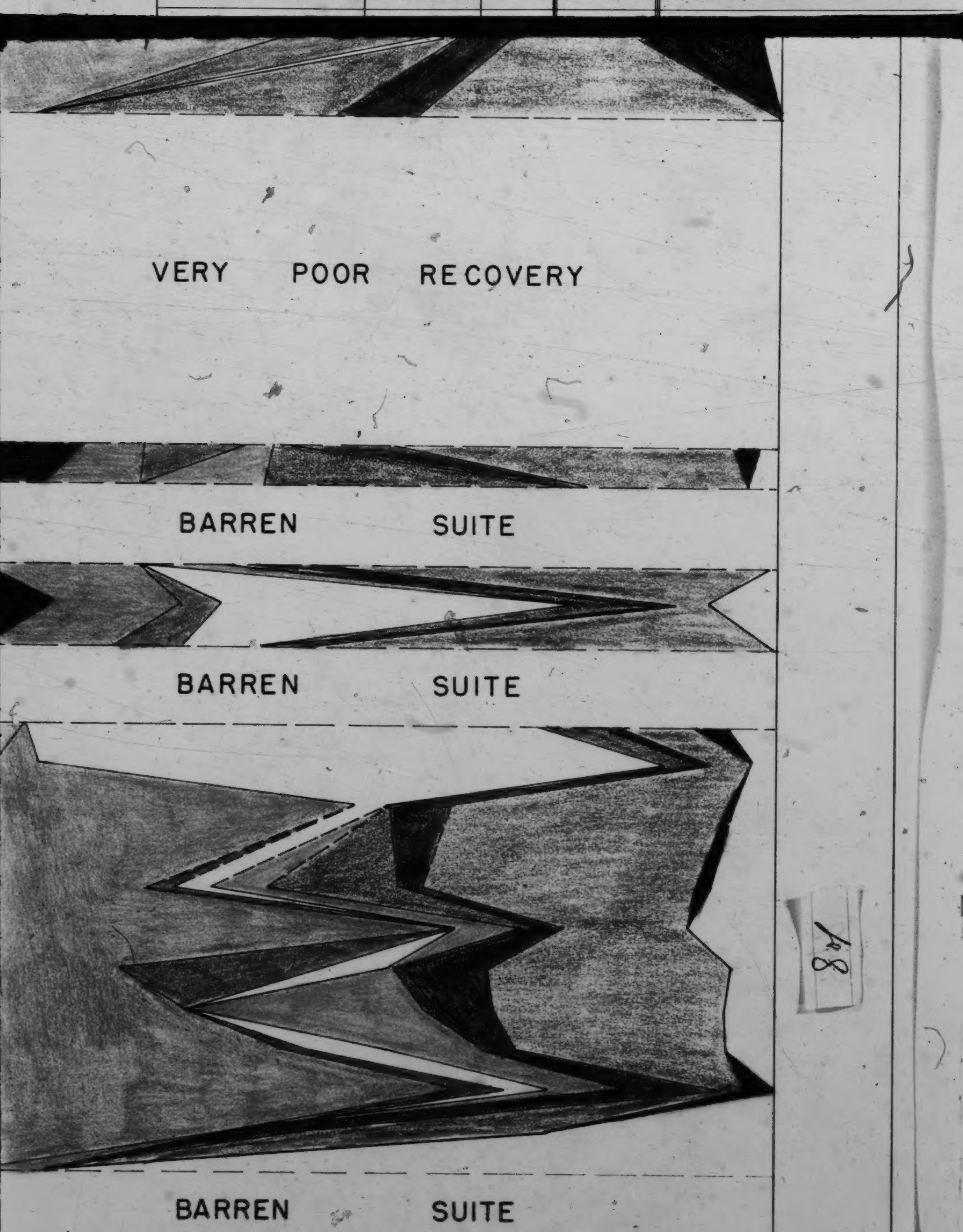
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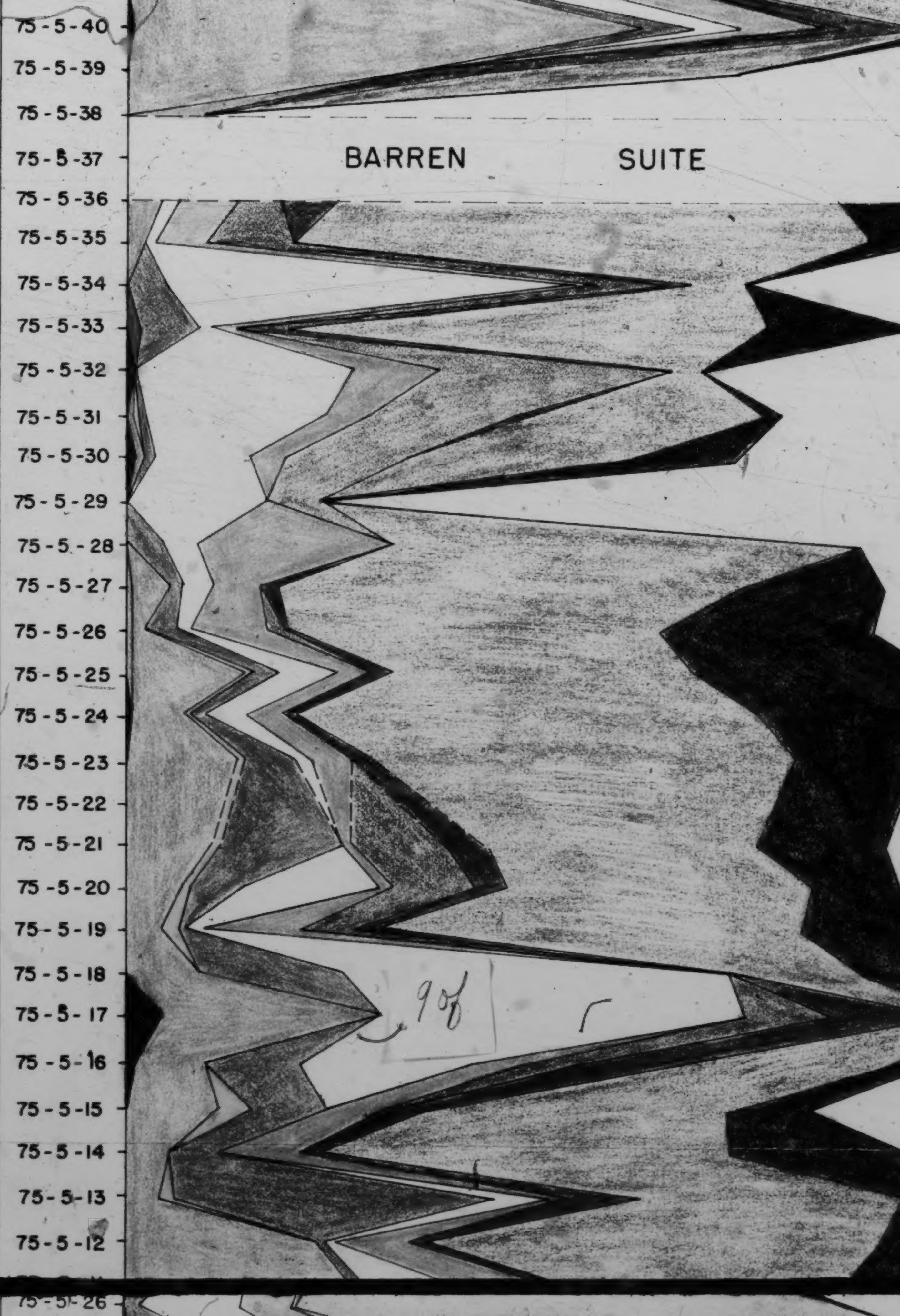
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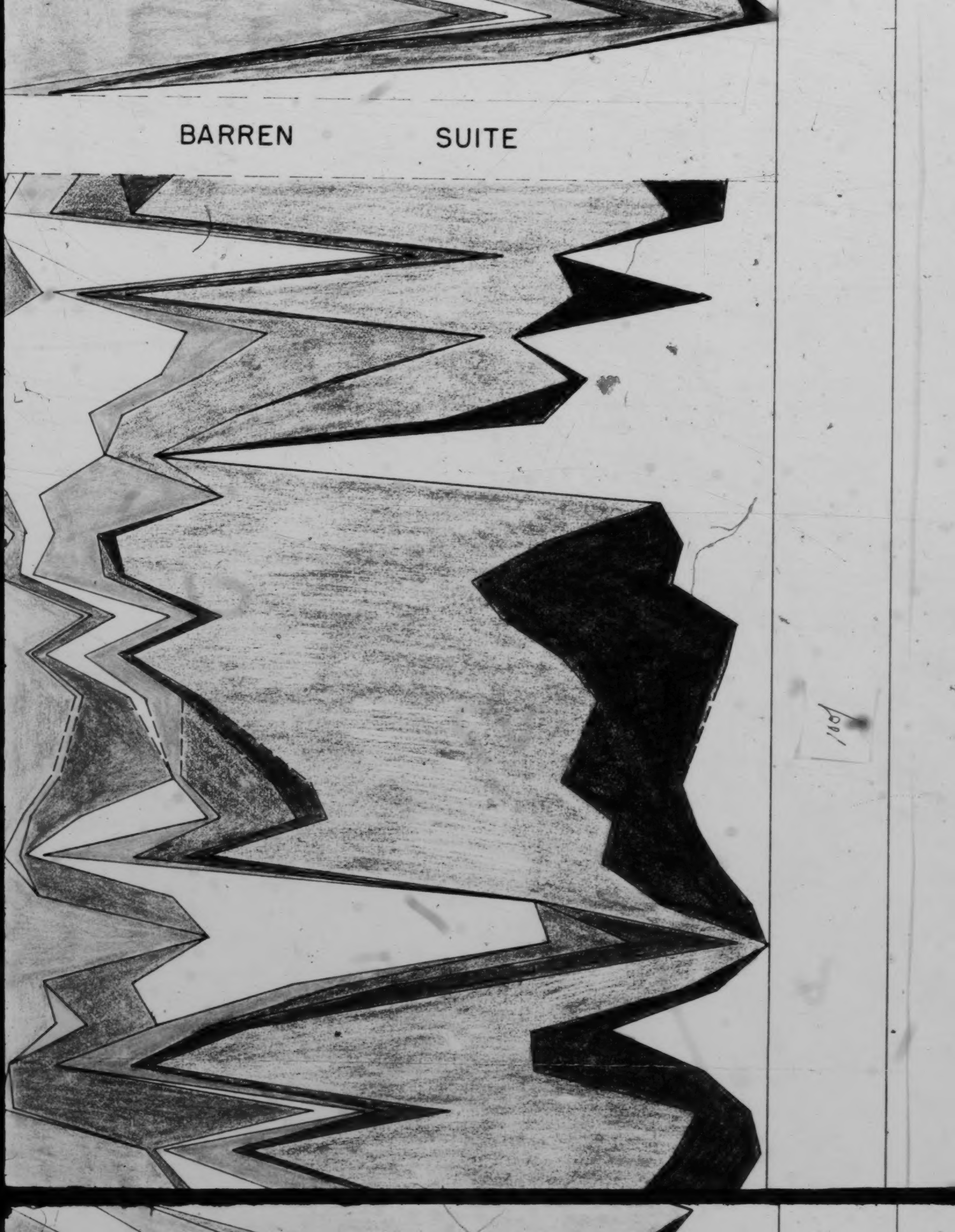
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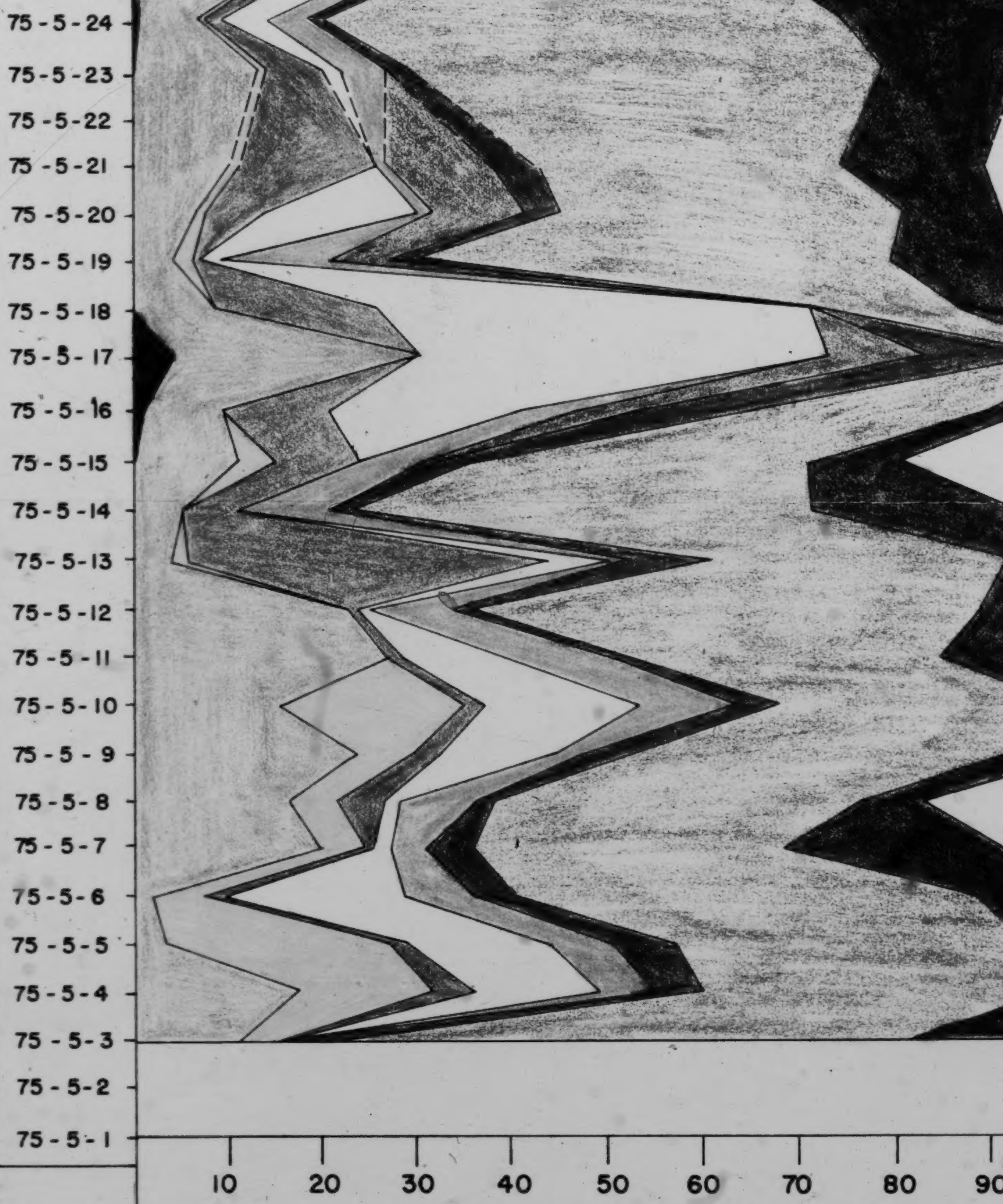

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FIGURE 13 VERTICAL SCALE : 1cm. = 1.5r

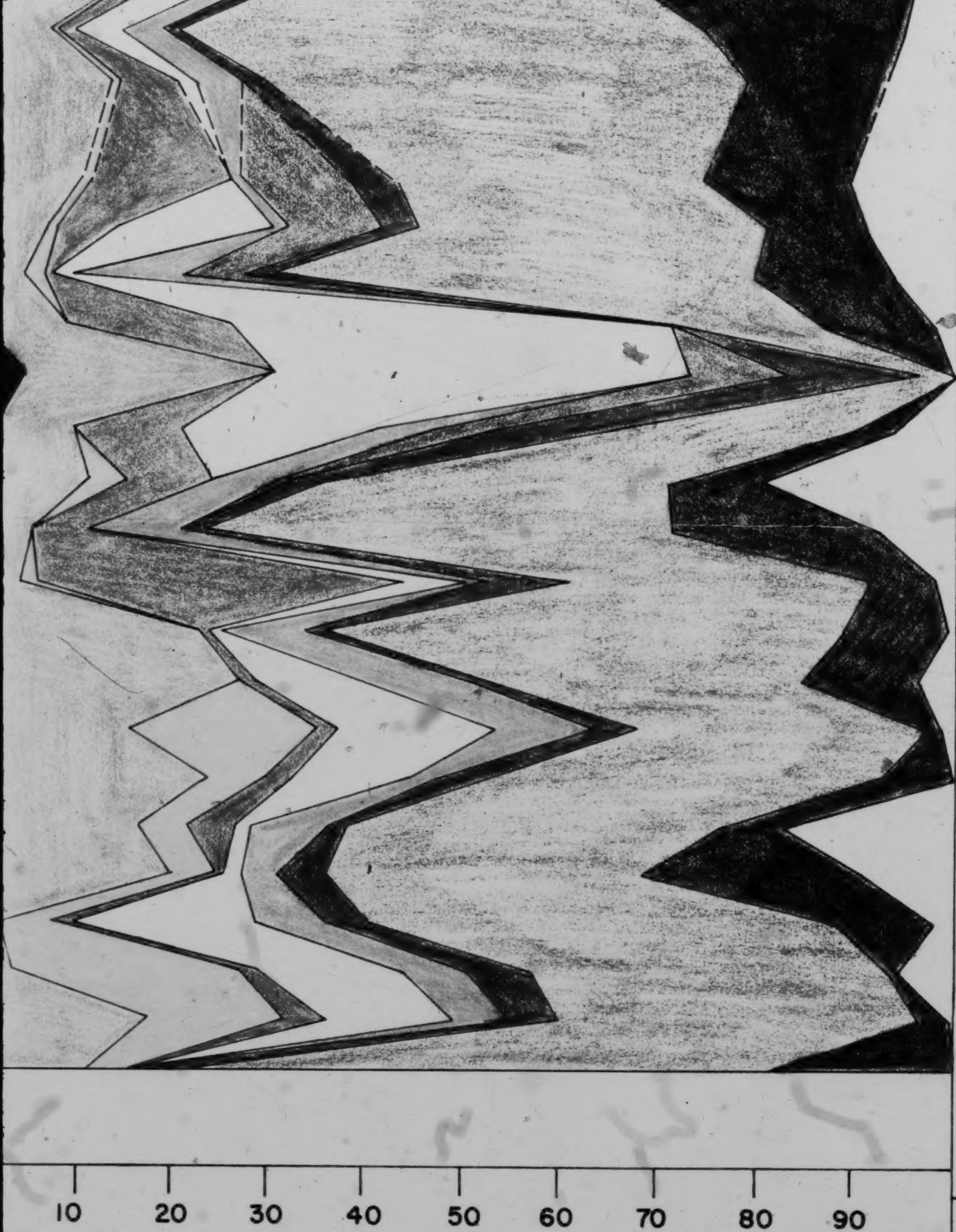

FIGURE 13 VERTICAL SCALE : 1cm. = 1.5m.

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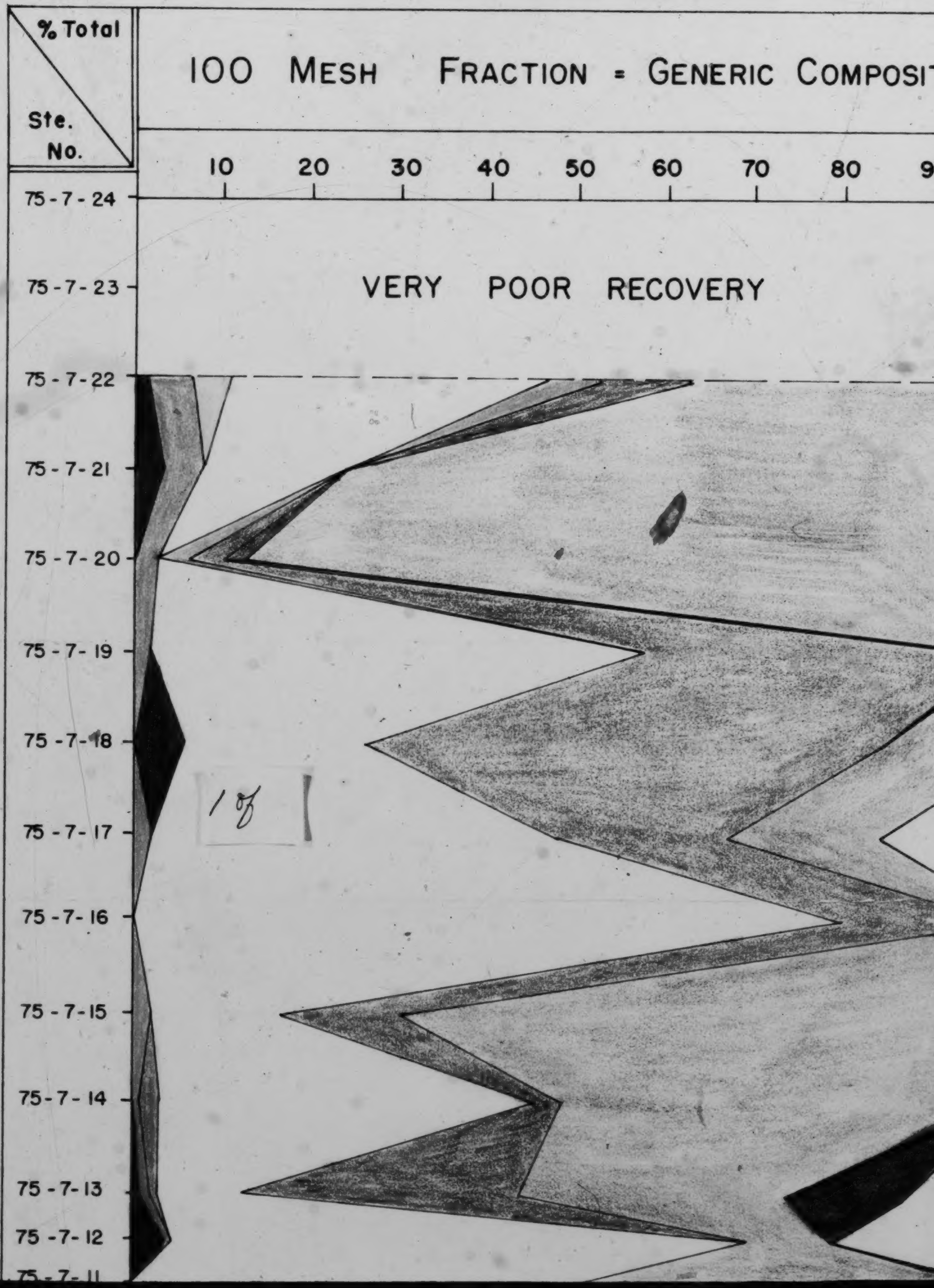
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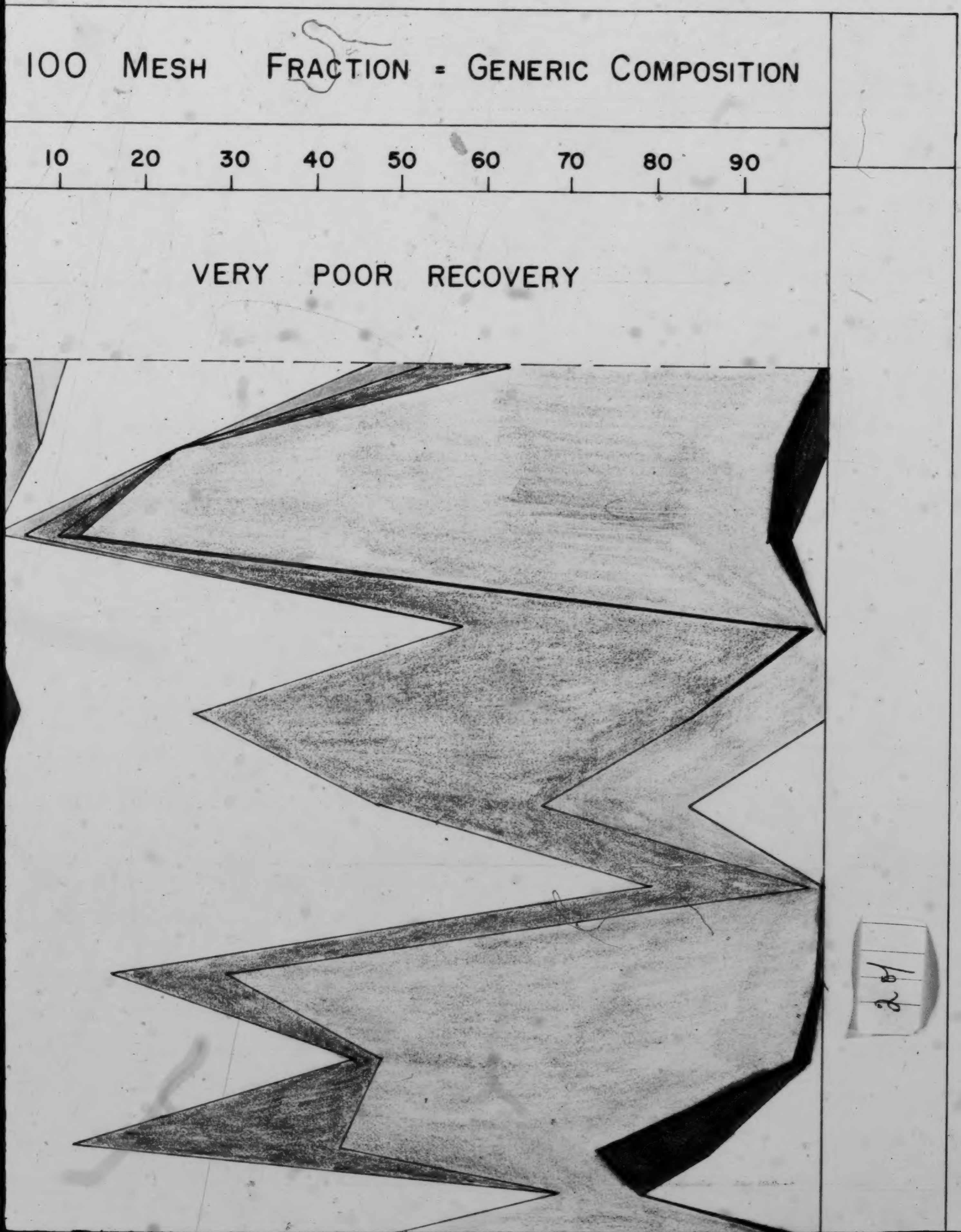
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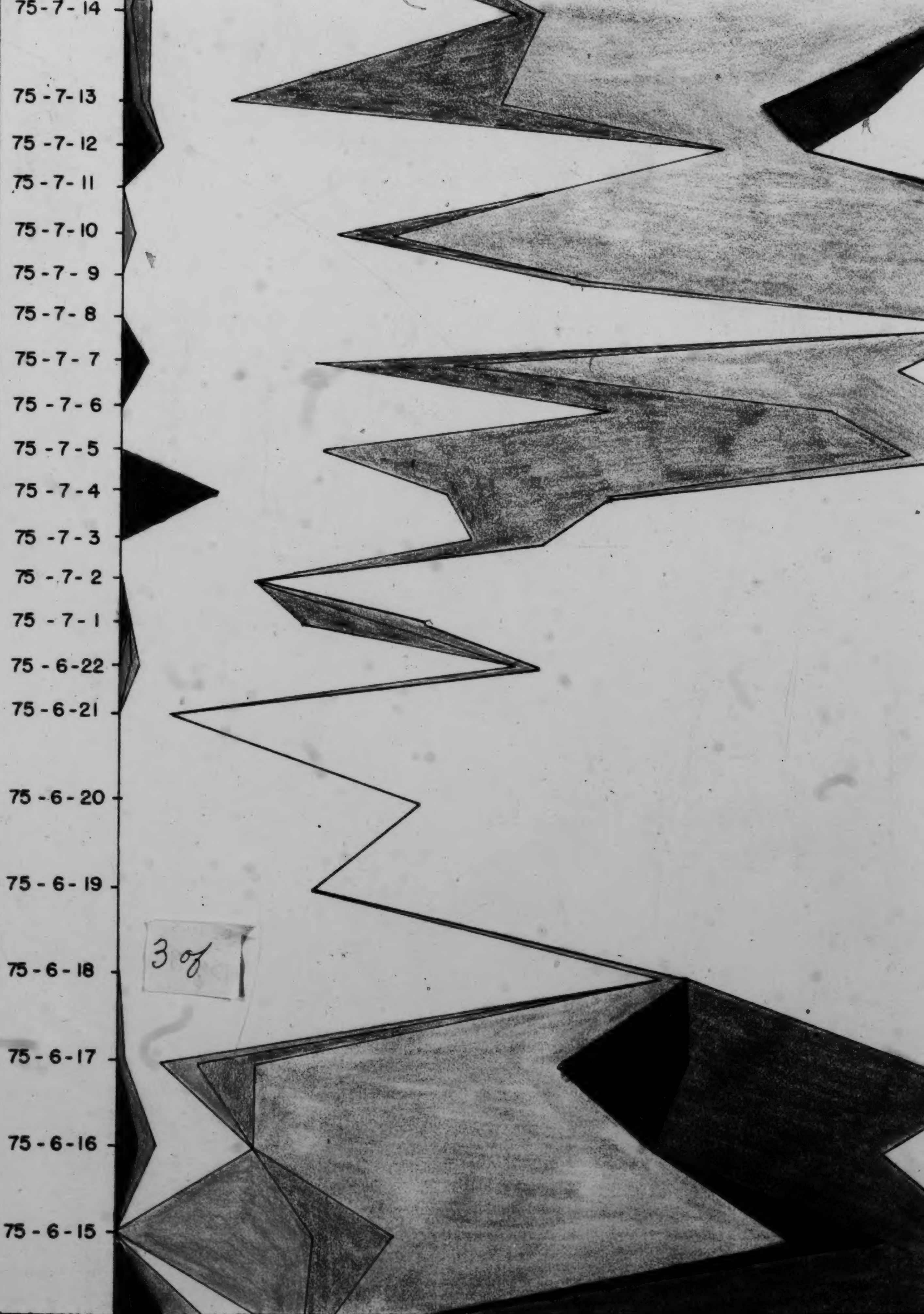
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75-7-5
75-7-4
75-7-3
75-7-2
75-7-1
75-6-22
75-6-21
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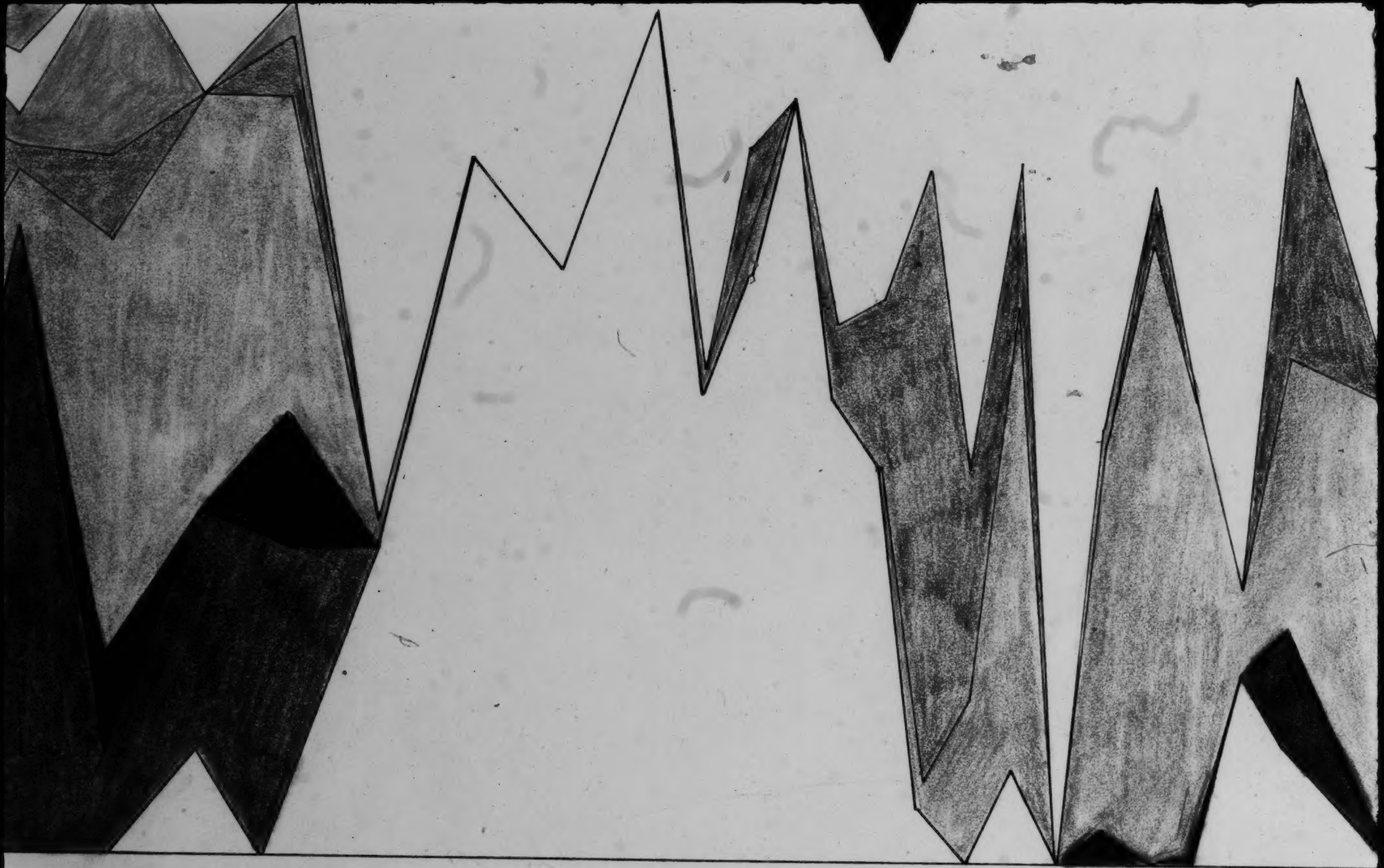
75-6-17
75-6-16
75-6-15

3 of |



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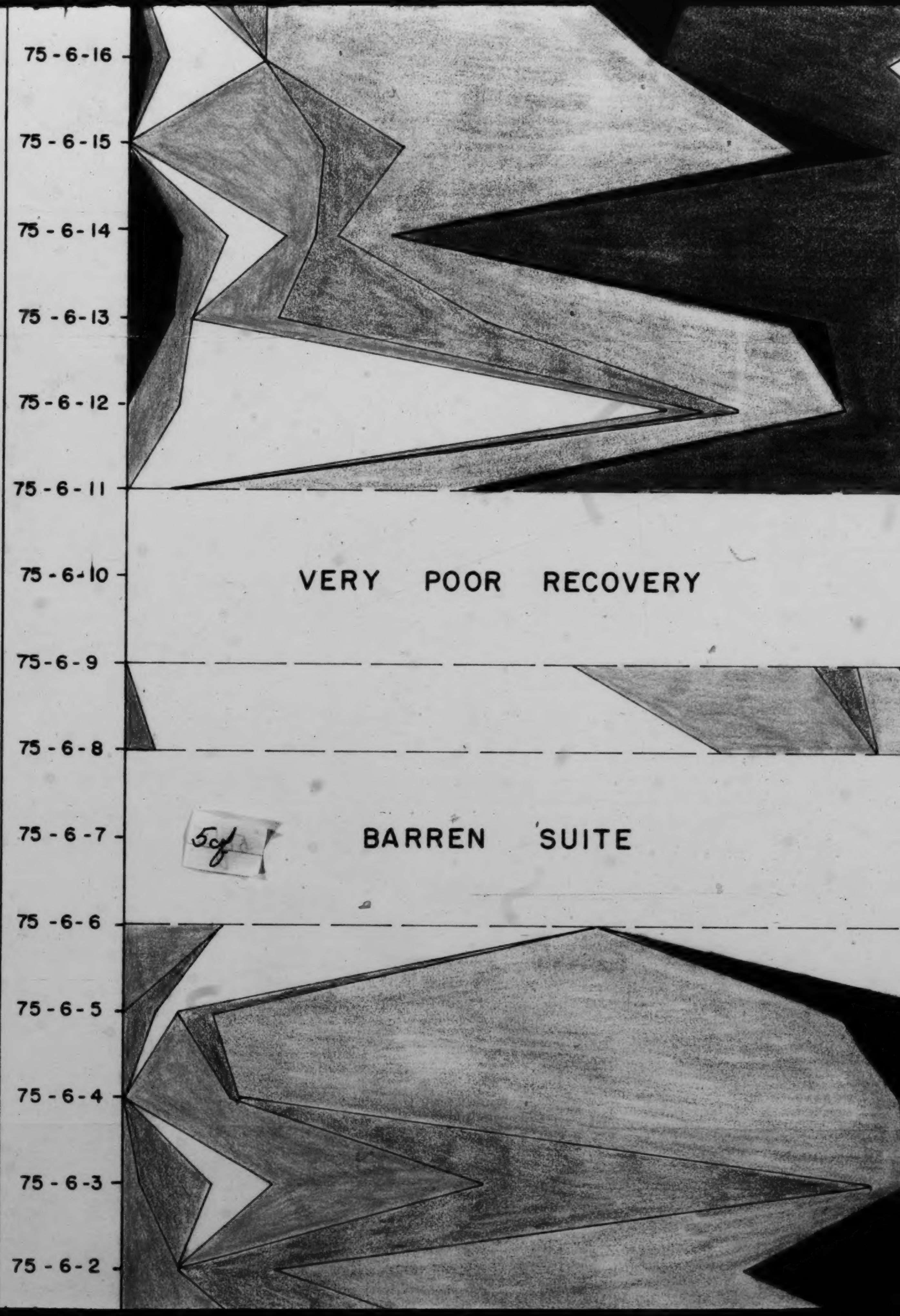
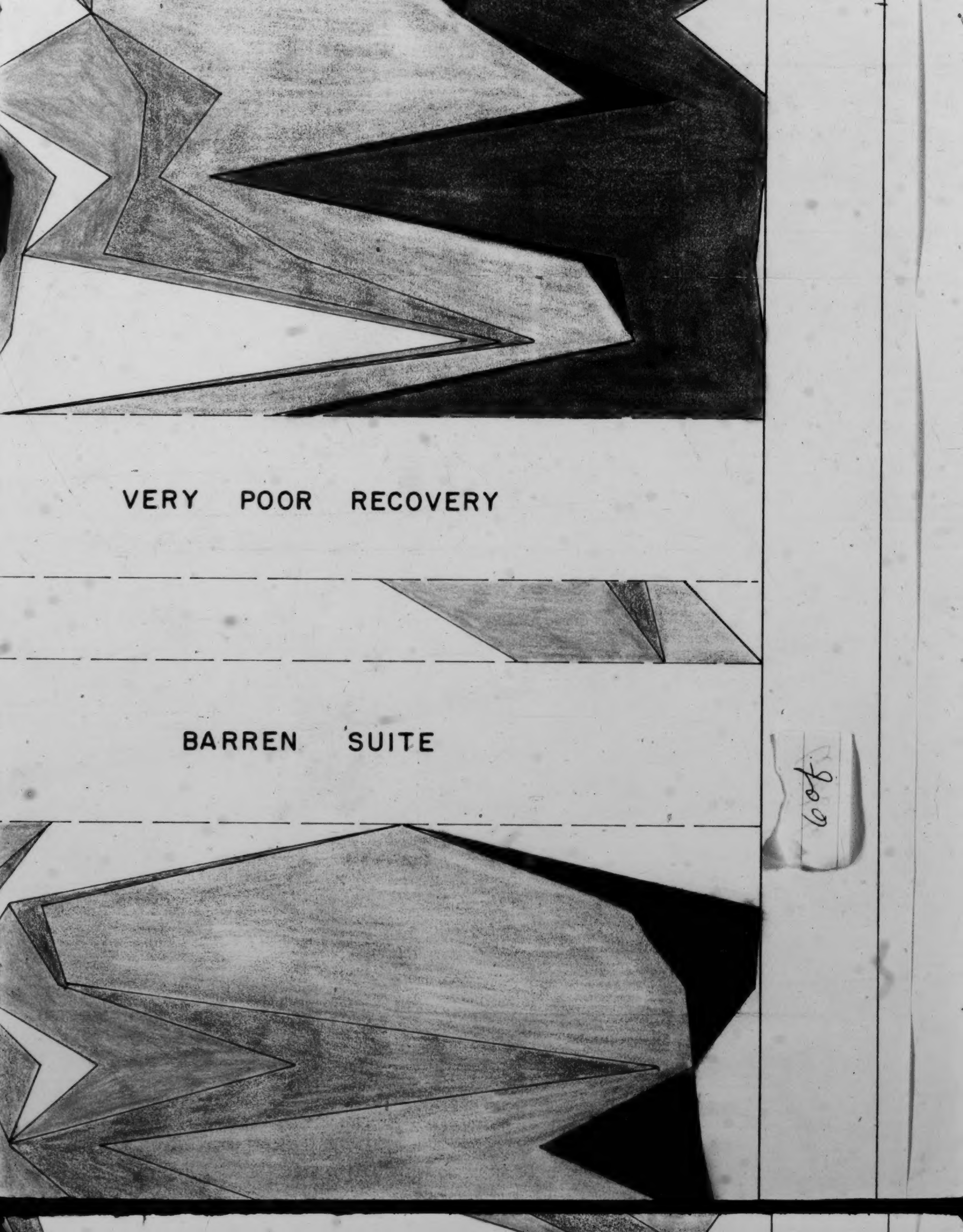
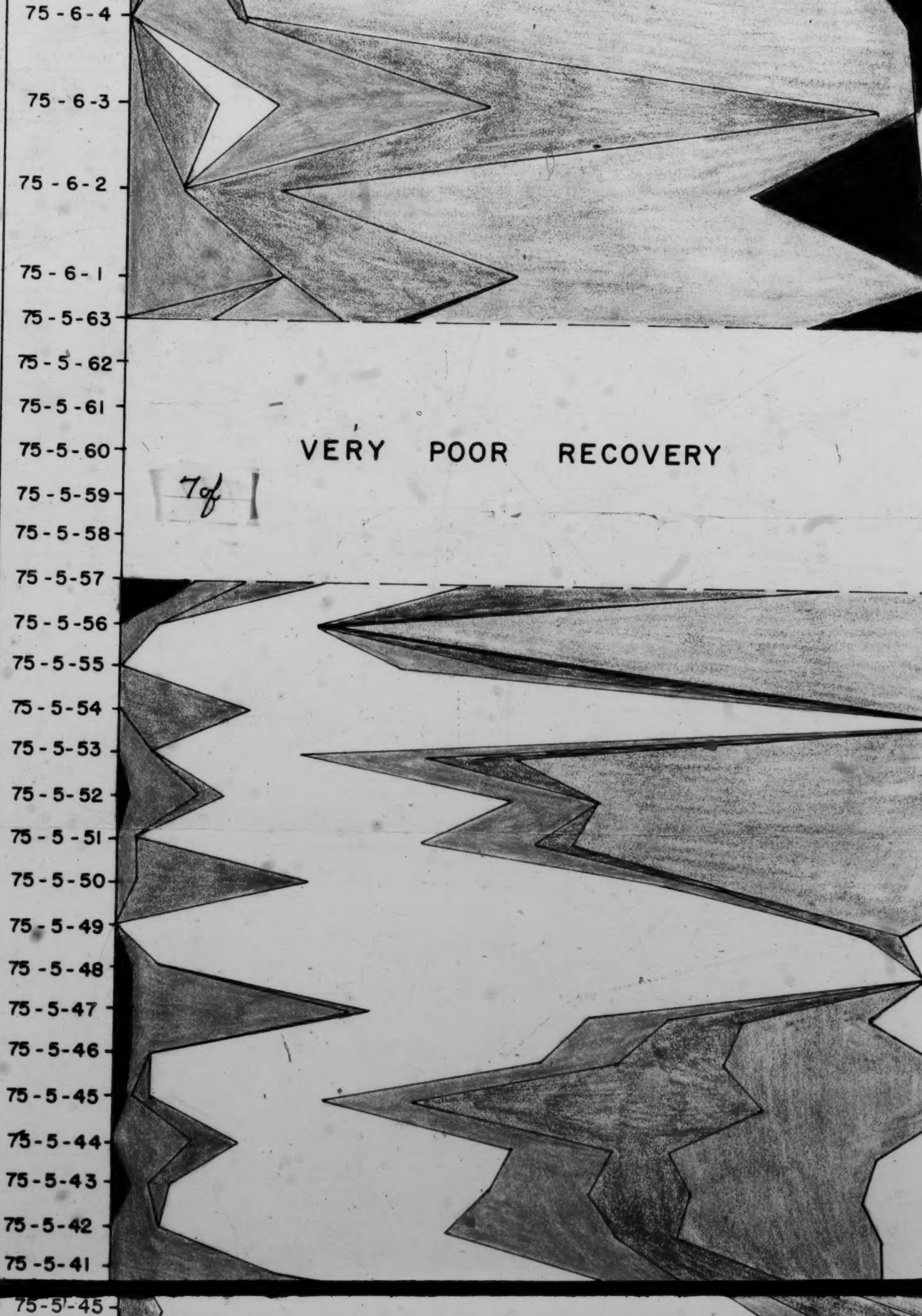

75 - 6 - 16
75 - 6 - 15
75 - 6 - 14
75 - 6 - 13
75 - 6 - 12
75 - 6 - 11
75 - 6 - 10
VERY POOR RECOVERY
75 - 6 - 9
75 - 6 - 8
75 - 6 - 7
5cf
BARREN SUITE
75 - 6 - 6
75 - 6 - 5
75 - 6 - 4
75 - 6 - 3
75 - 6 - 2


VERY POOR RECOVERY
BARREN SUITE
609


75-6-4
75-6-3
75-6-2
75-6-1
75-5-63
75-5-62
75-5-61
75-5-60
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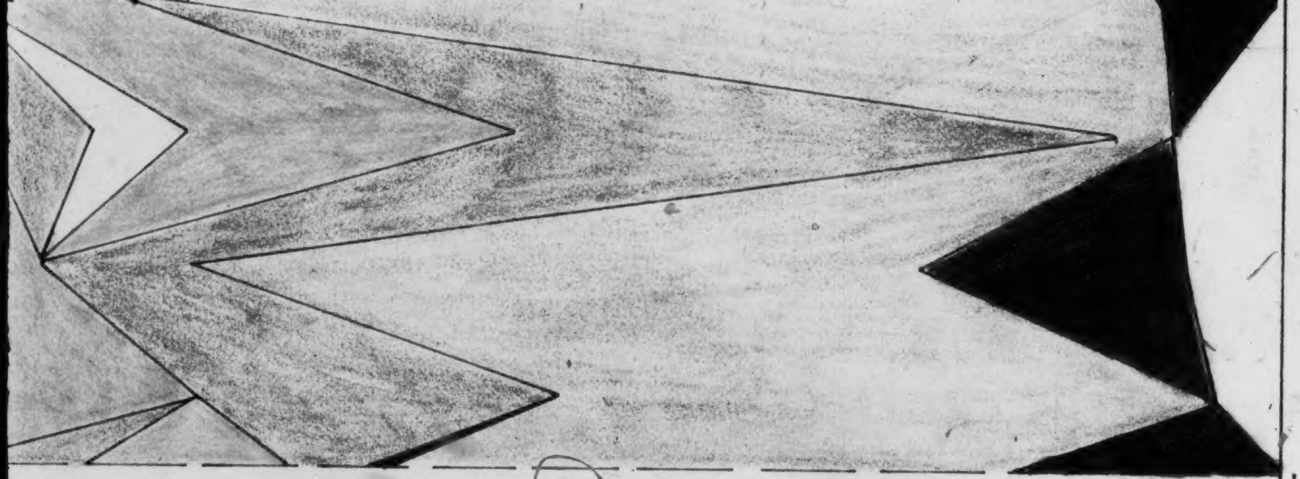
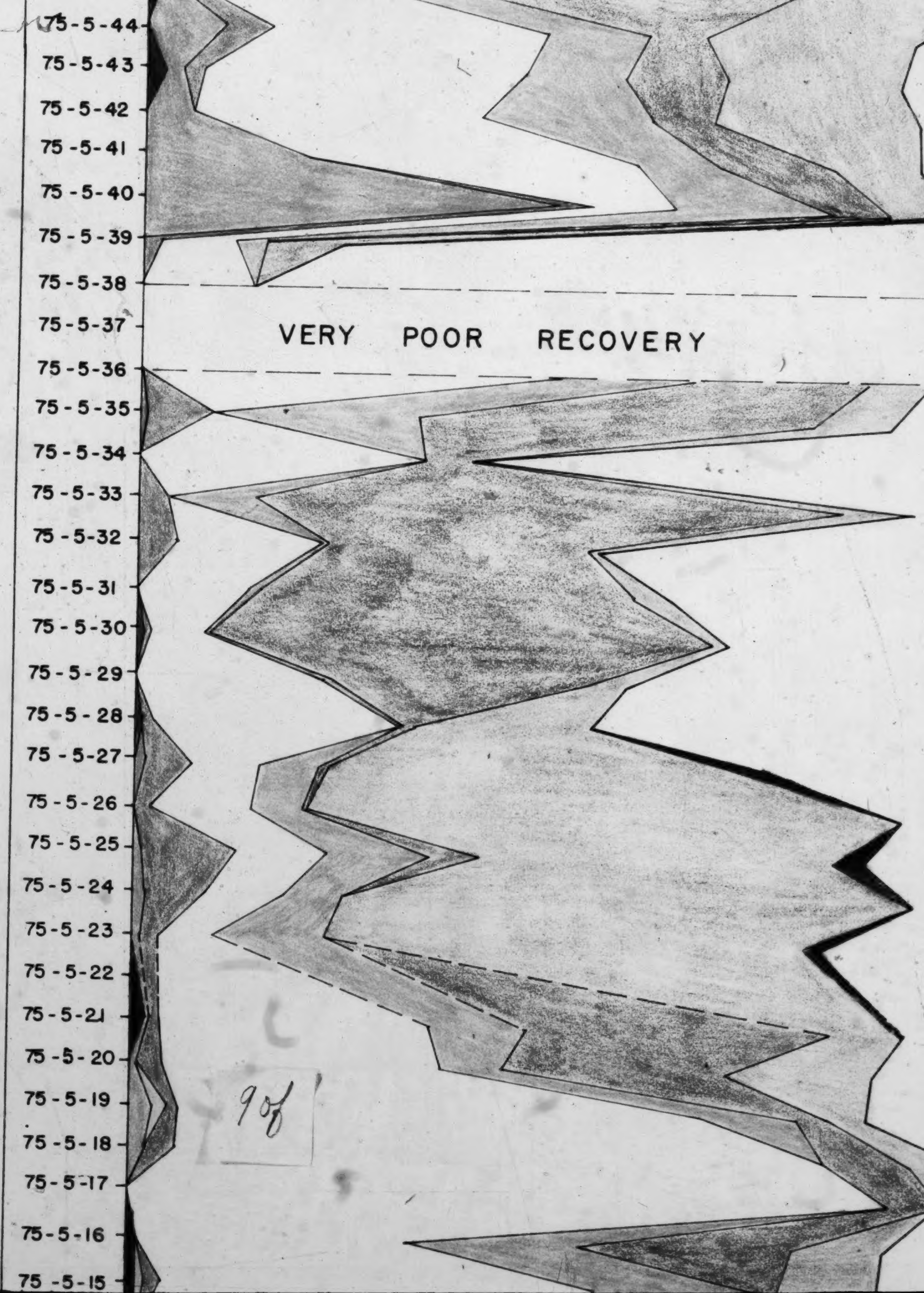
75-5-58
75-5-57
75-5-56
75-5-55
75-5-54
75-5-53
75-5-52
75-5-51
75-5-50
75-5-49
75-5-48
75-5-47
75-5-46
75-5-45
75-5-44
75-5-43
75-5-42
75-5-41
VERY POOR RECOVERY
7of
75-5-45



VERY POOR RECOVERY

1.8


75-5-44
75-5-43
75-5-42
75-5-41
75-5-40
75-5-39
75-5-38
75-5-37
VERY POOR RECOVERY
75-5-36
75-5-35
75-5-34
75-5-33
75-5-32
75-5-31
75-5-30
75-5-29
75-5-28
75-5-27
75-5-26
75-5-25
75-5-24
75-5-23
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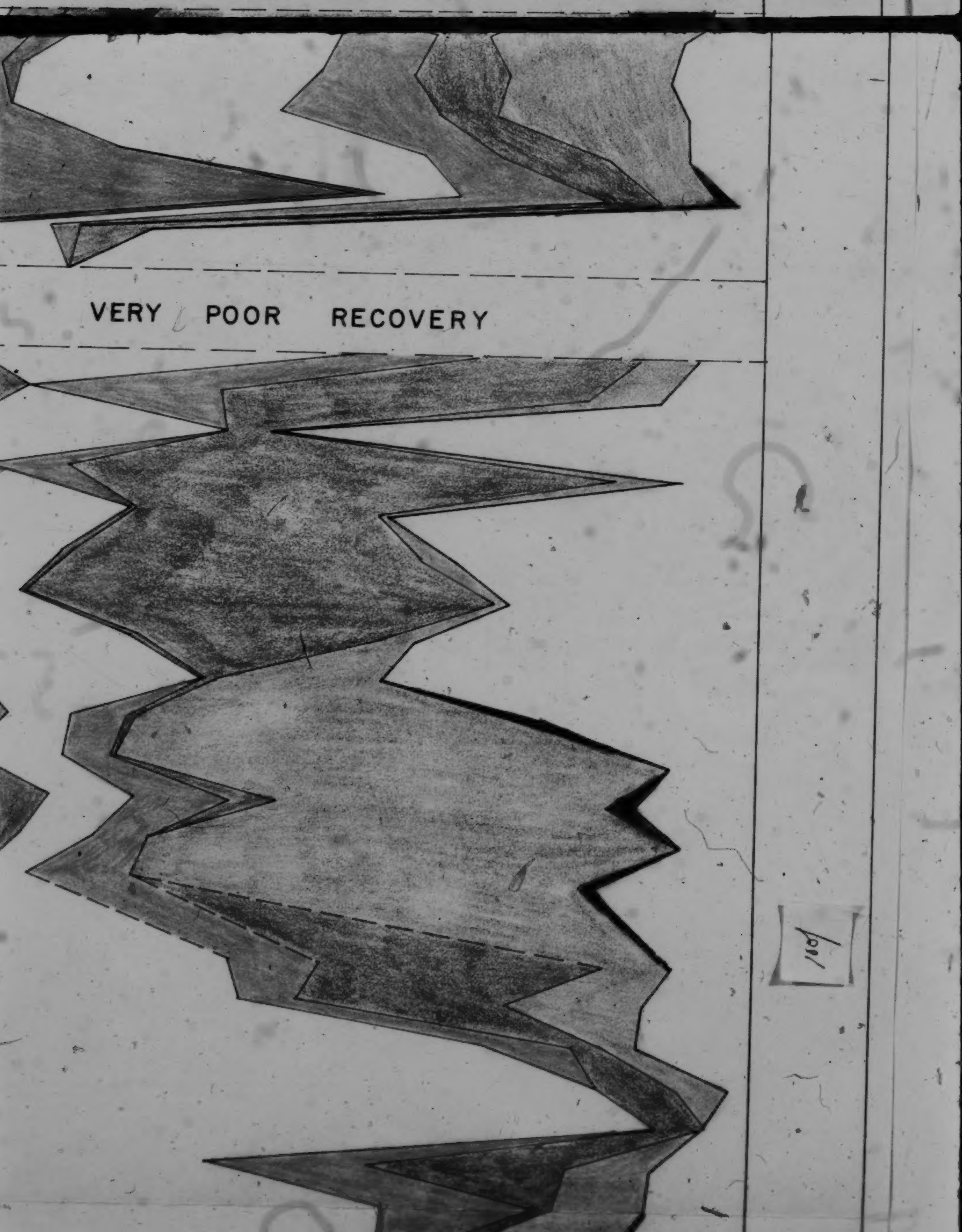
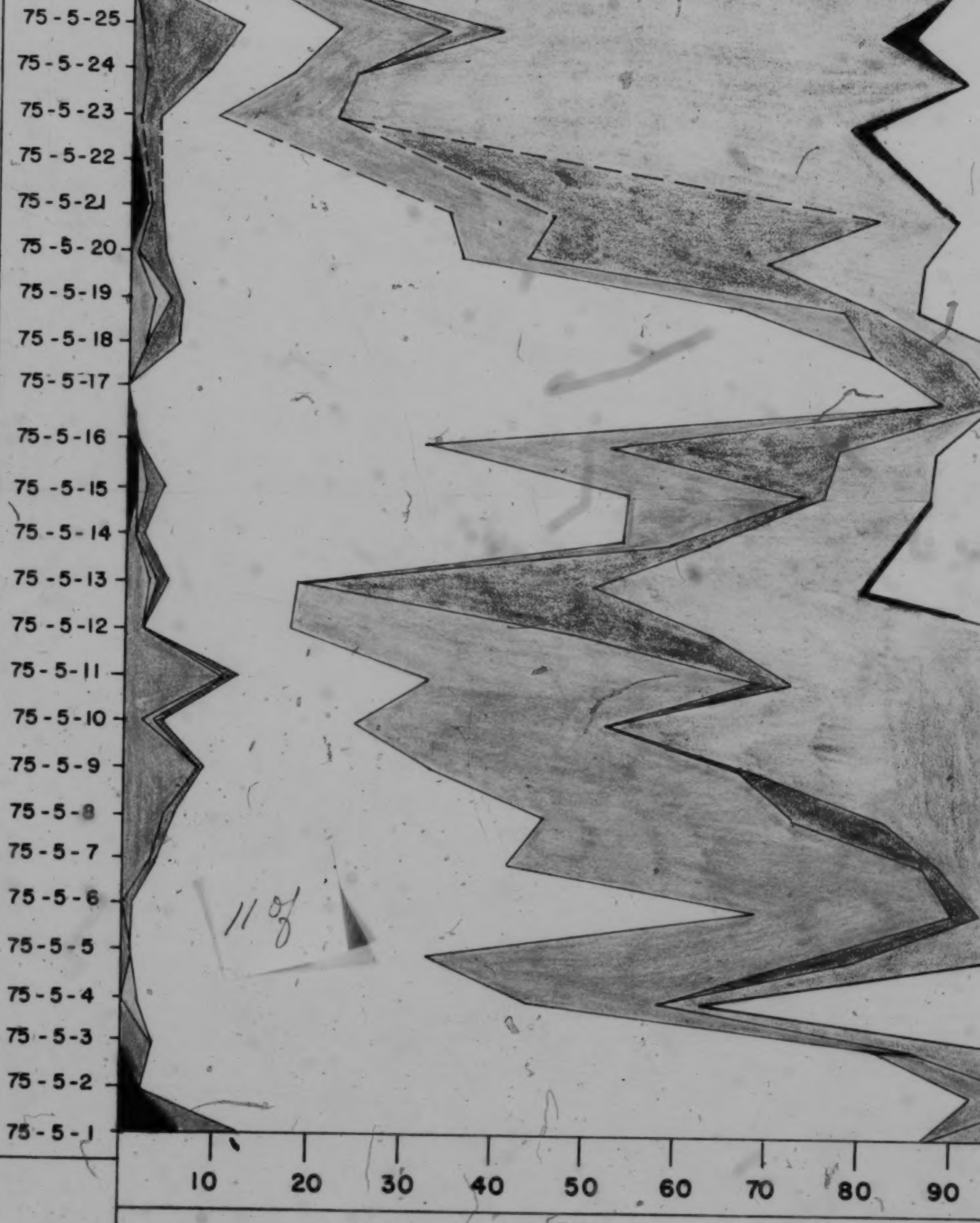
75-5-17
75-5-16
75-5-15
9of


VERY POOR RECOVERY
1001



11 of

FIGURE 12 VERTICAL SCALE : 1 cm.→ 1.5m.

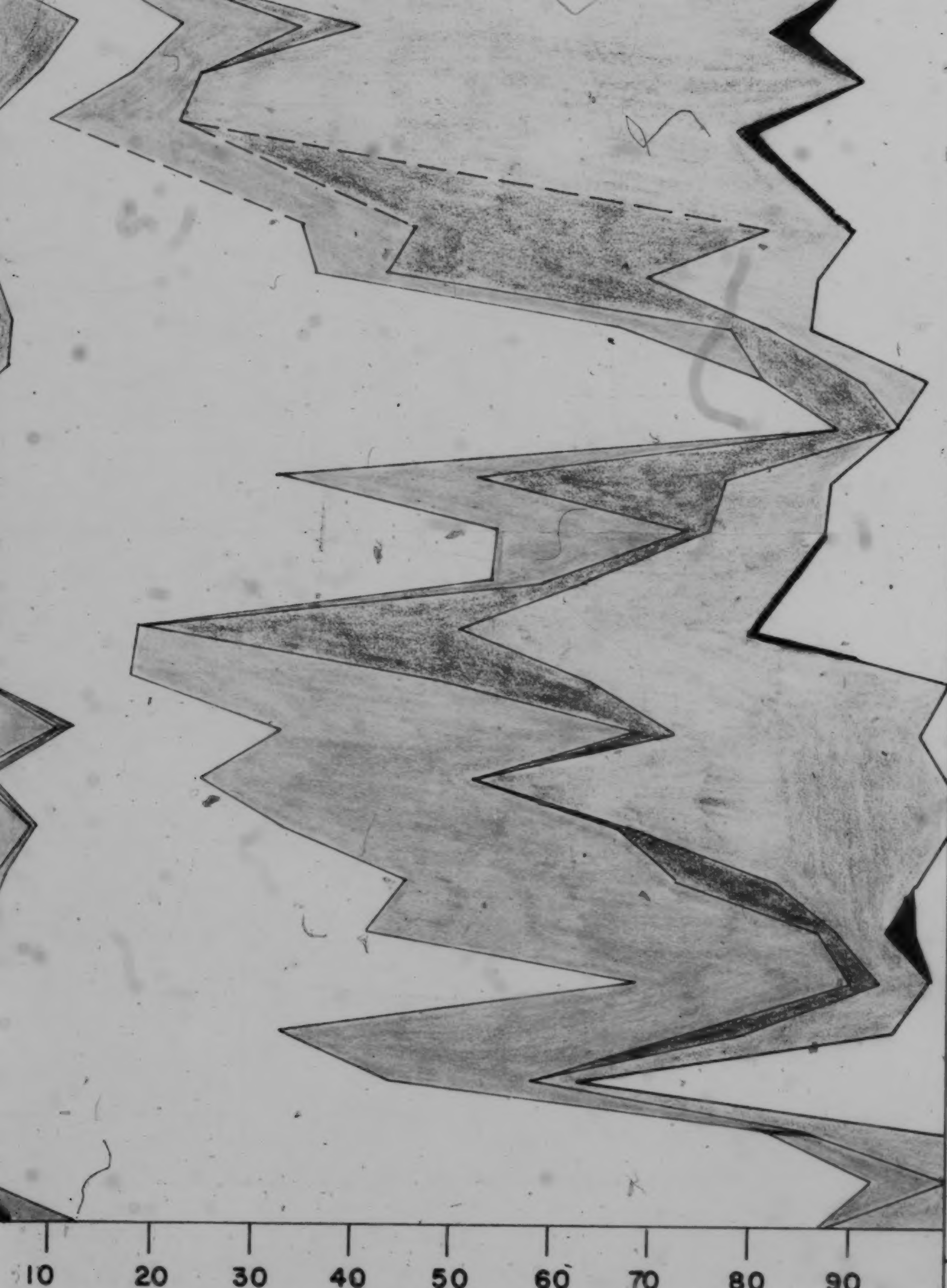
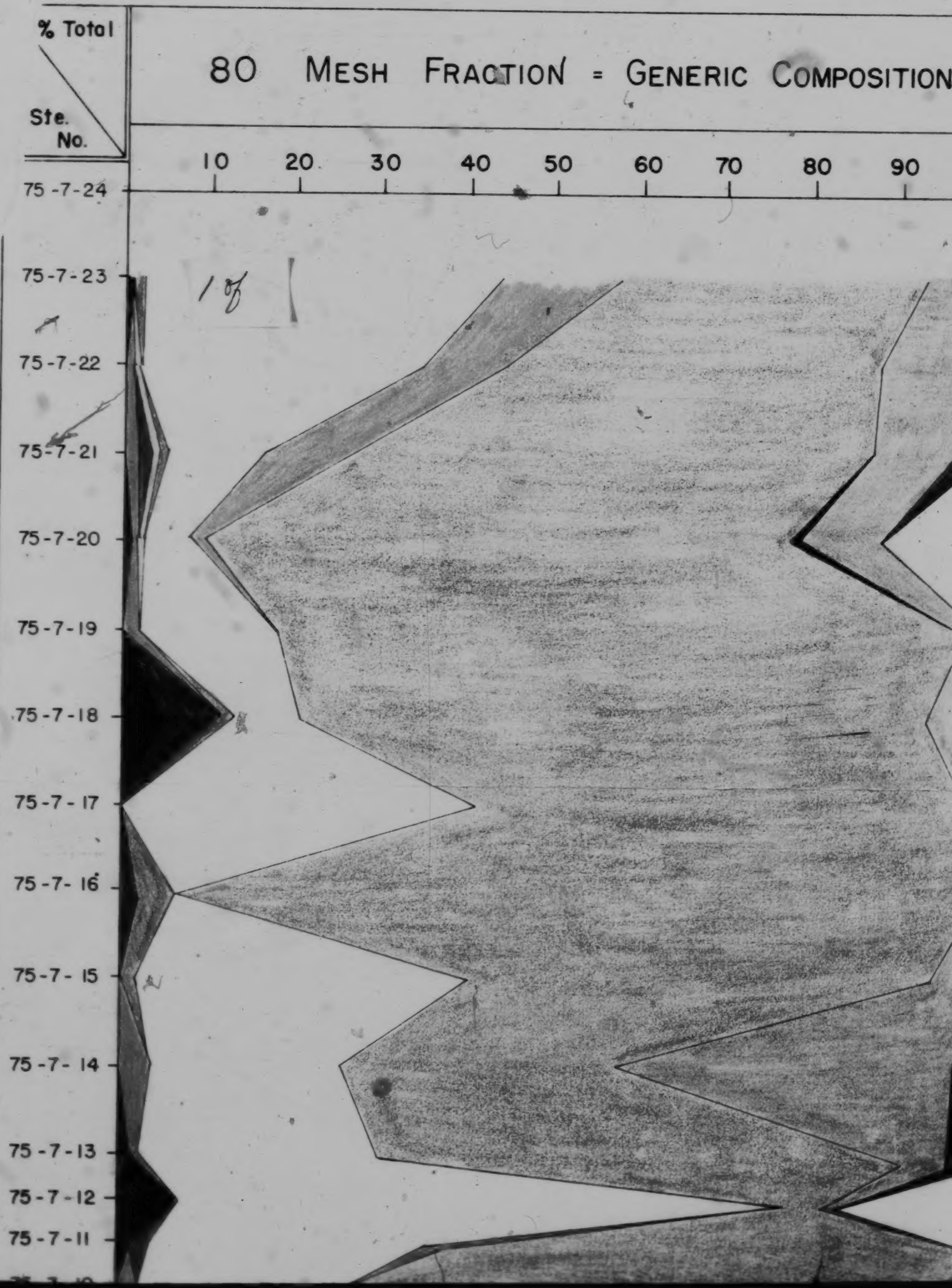
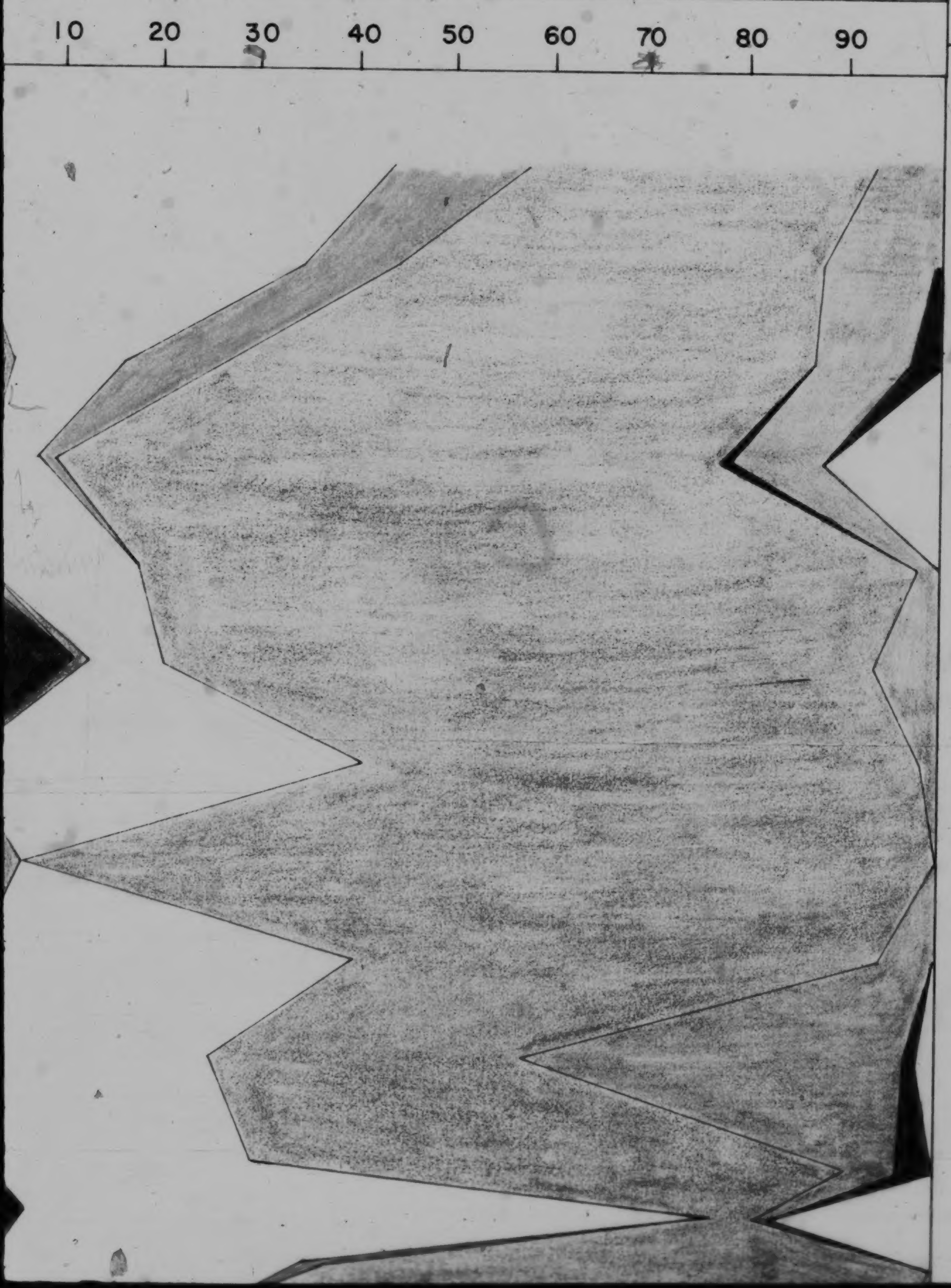


FIGURE 12 VERTICAL SCALE : 1 cm.= 1.5m.

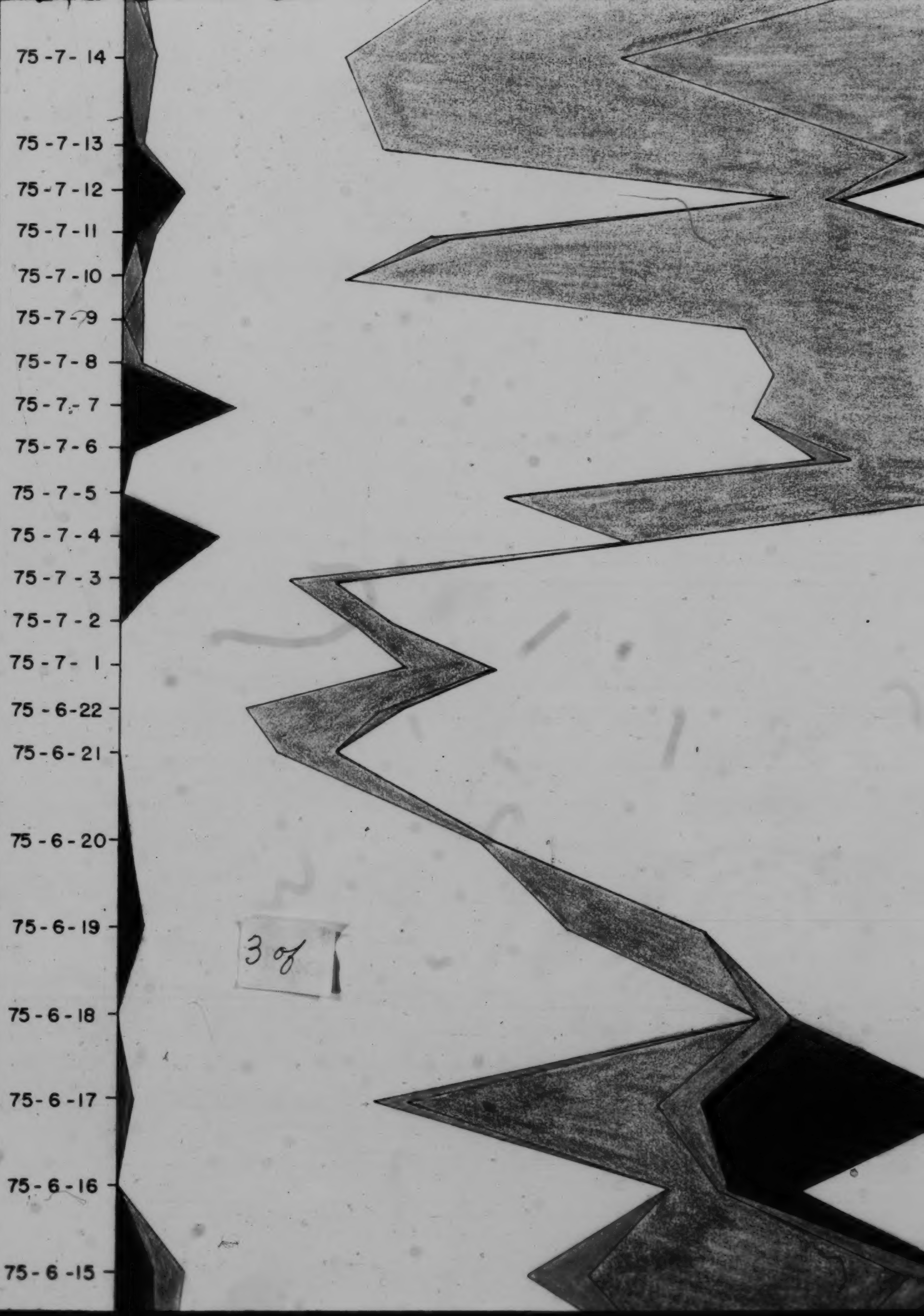
12 8/12


% Total
Ste. No.
80 MESH FRACTION = GENERIC COMPOSITION
10
20
30
40
50
60
70
80
90
75-7-24
75-7-23
75-7-22
75-7-21
75-7-20
75-7-19
75-7-18
75-7-17
75-7-16
75-7-15
75-7-14
75-7-13
75-7-12
75-7-11
1 of

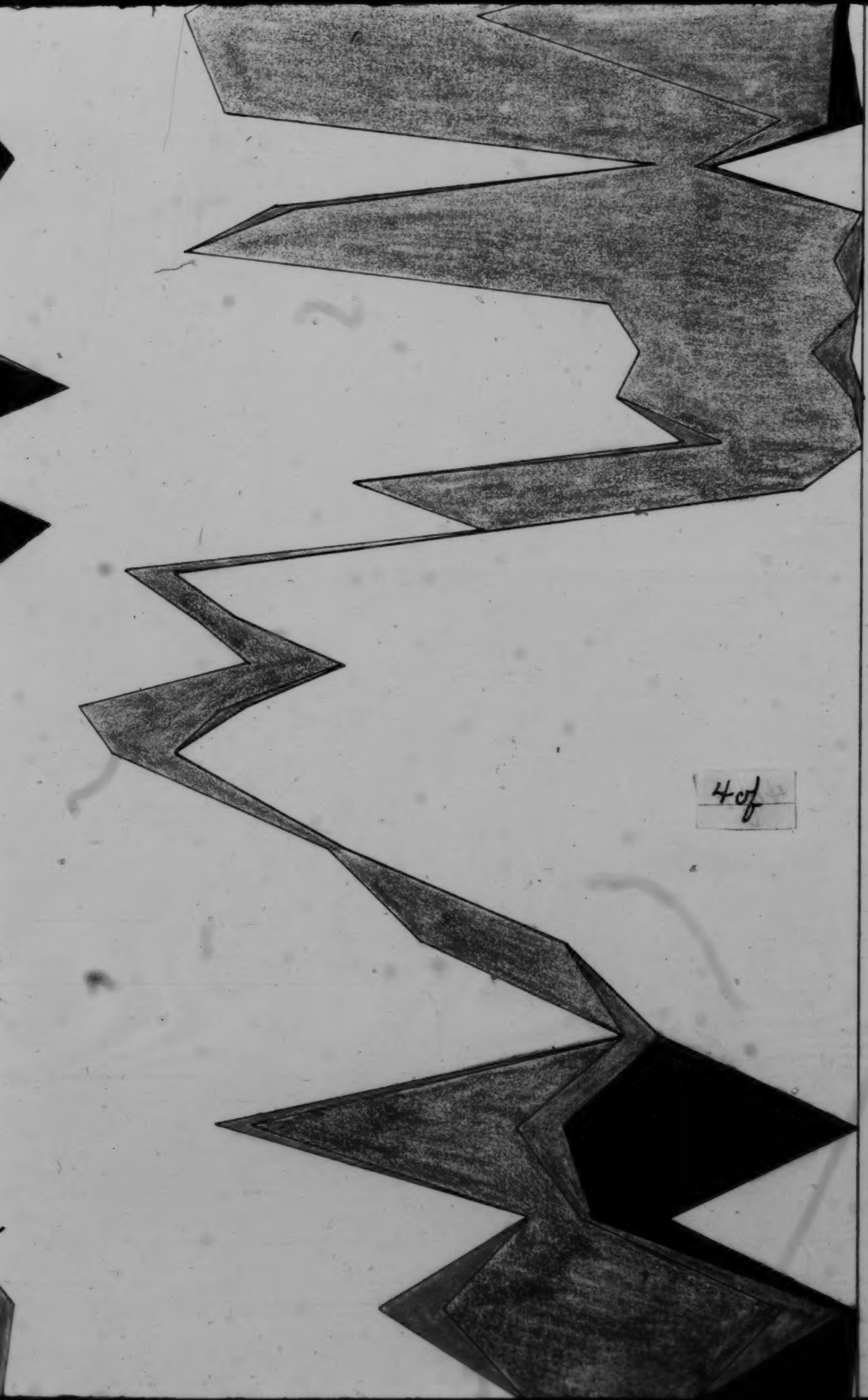
80 MESH FRACTION = GENERIC COMPOSITION



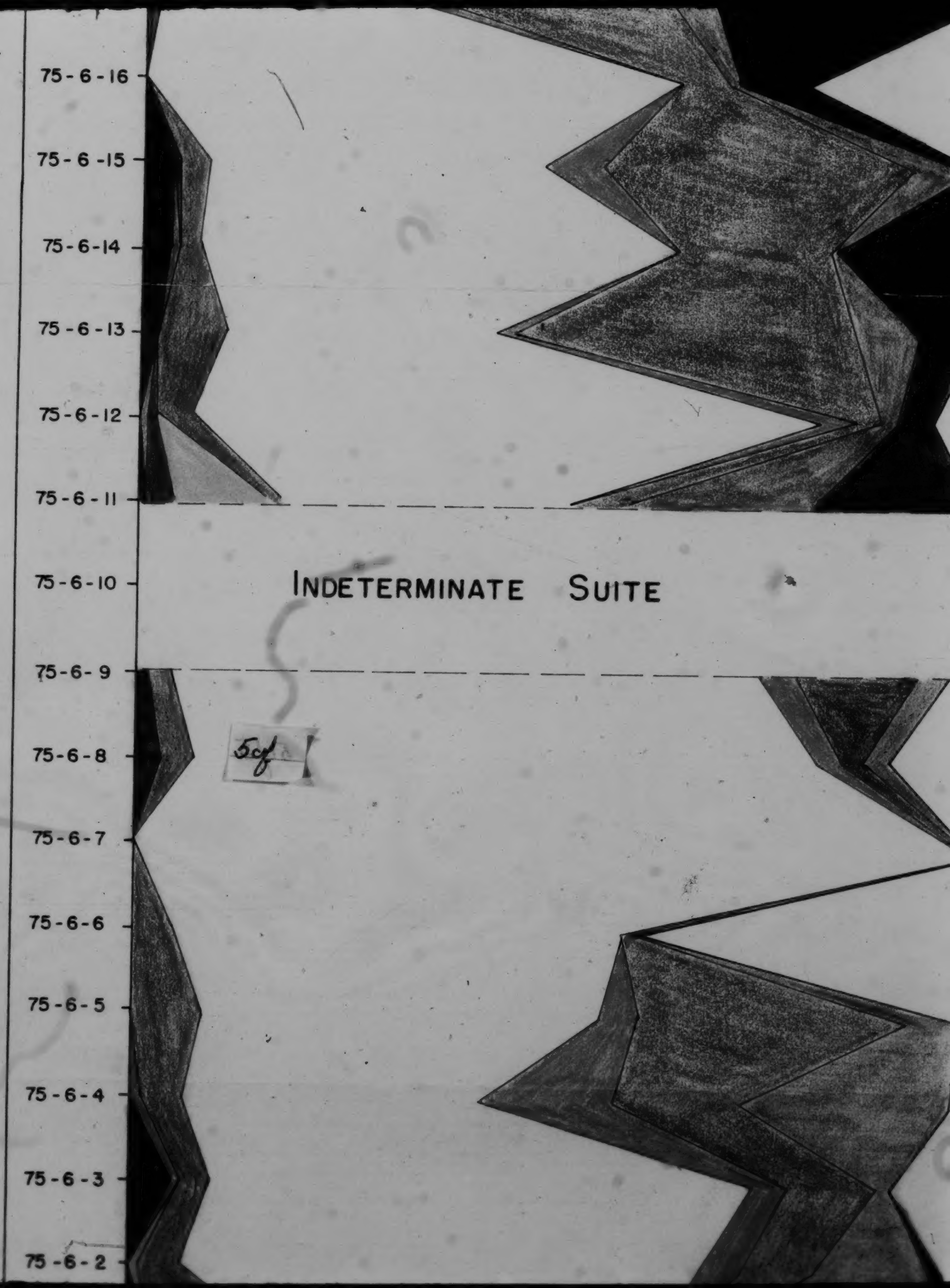
27

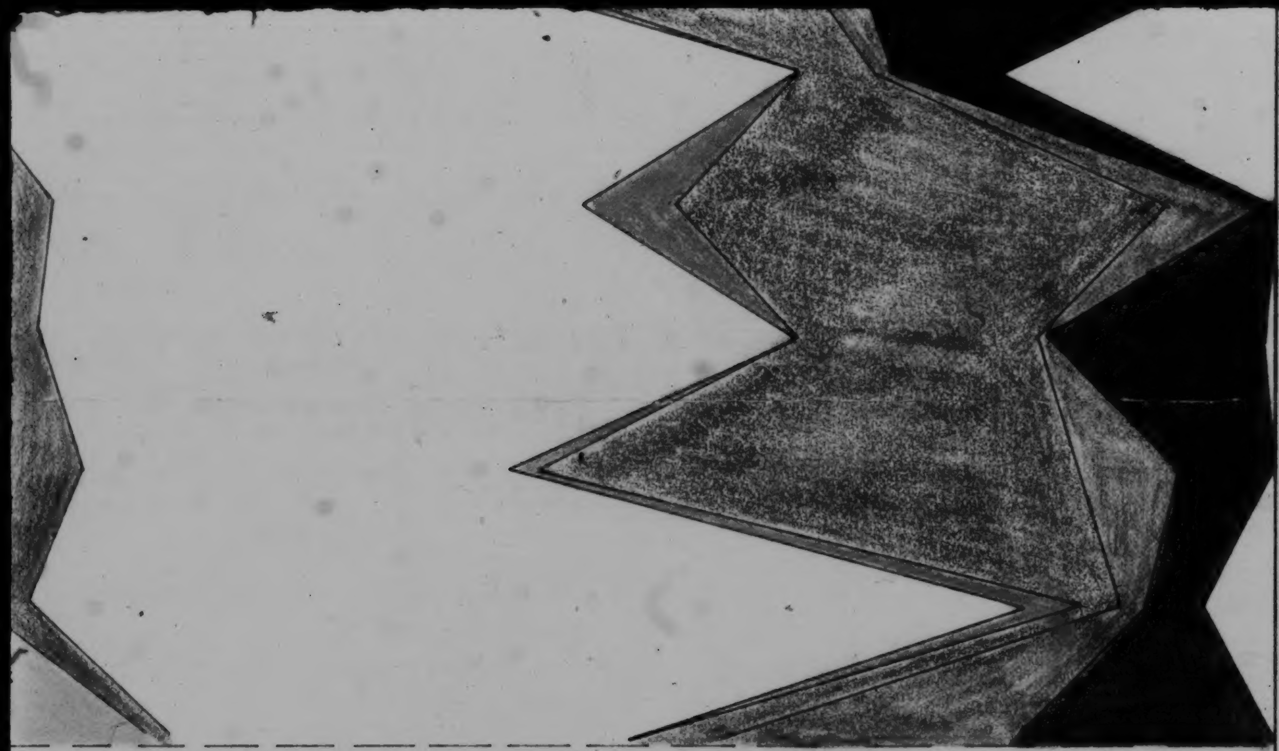

75-7-14
75-7-13
75-7-12
75-7-11
75-7-10
75-7-9
75-7-8
75-7-7
75-7-6
75-7-5
75-7-4
75-7-3
75-7-2
75-7-1
75-6-22
75-6-21
75-6-20
75-6-19
75-6-18
75-6-17
75-6-16
75-6-15

3 of

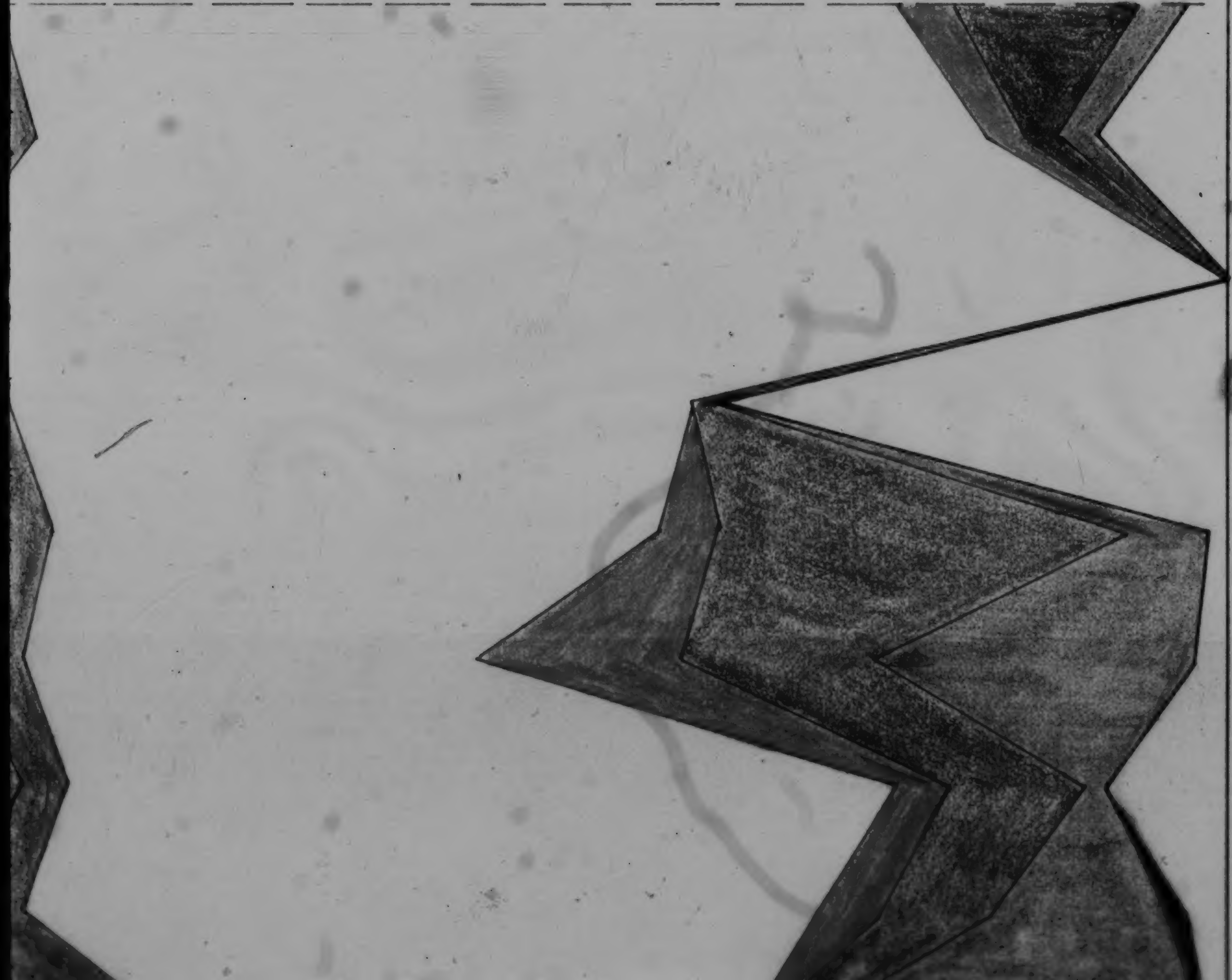


4of

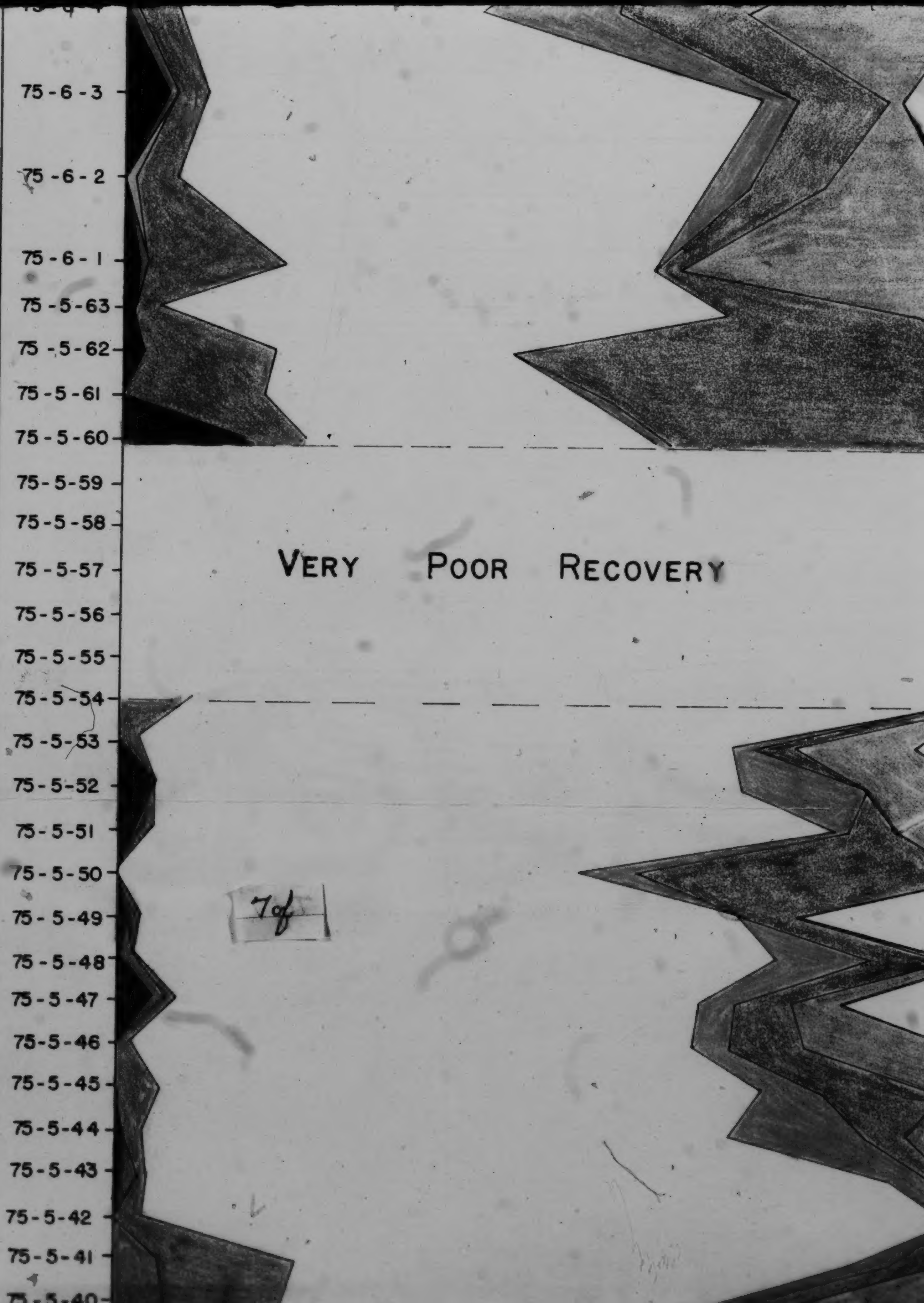

75-6-16
75-6-15
75-6-14
75-6-13
75-6-12
75-6-11
75-6-10
INDETERMINATE SUITE
75-6-9
5cf
75-6-8
75-6-7
75-6-6
75-6-5
75-6-4
75-6-3
75-6-2



INDETERMINATE SUITE



606


75-6-3
75-6-2
75-6-1
75-5-63
75-5-62
75-5-61
75-5-60
75-5-59
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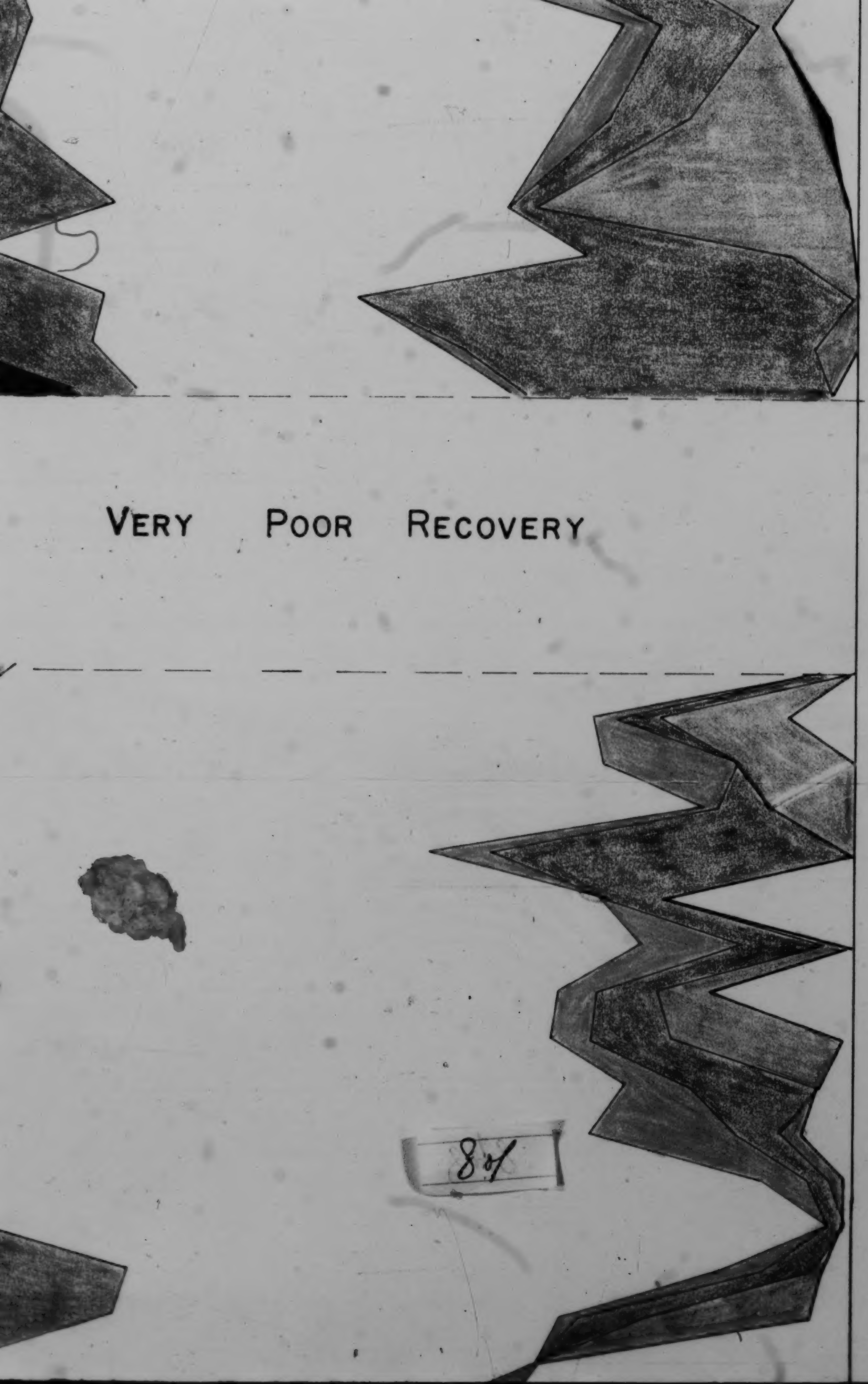
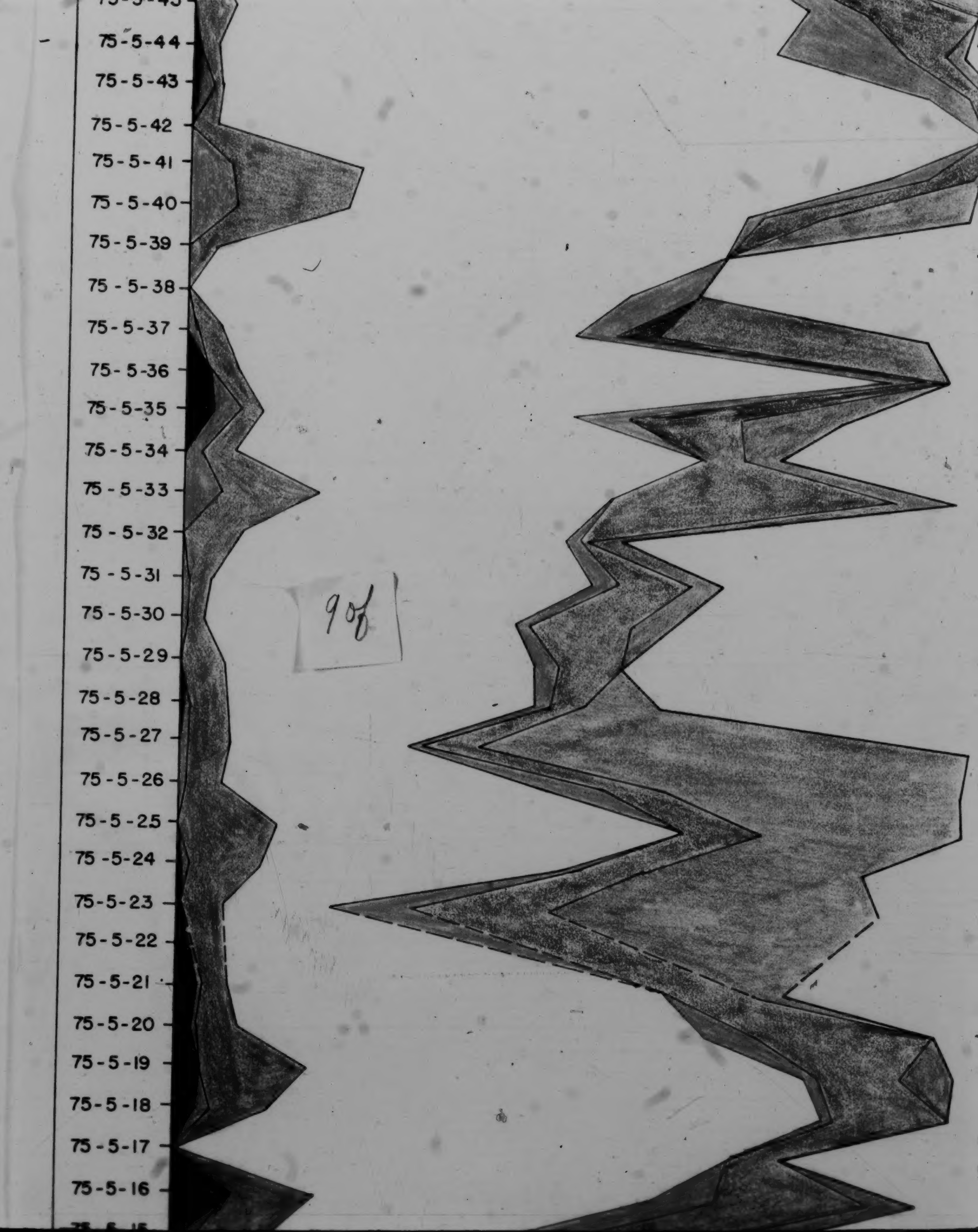
75-5-57
75-5-56
75-5-55
75-5-54
75-5-53
75-5-52
75-5-51
75-5-50
75-5-49
75-5-48
75-5-47
75-5-46
75-5-45
75-5-44
75-5-43
75-5-42
75-5-41
75-5-40
VERY POOR RECOVERY

7of


VERY POOR RECOVERY
8d


75-5-44
75-5-43
75-5-42
75-5-41
75-5-40
75-5-39
75-5-38
75-5-37
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75-5-35
75-5-34
75-5-33
75-5-32
75-5-31
75-5-30
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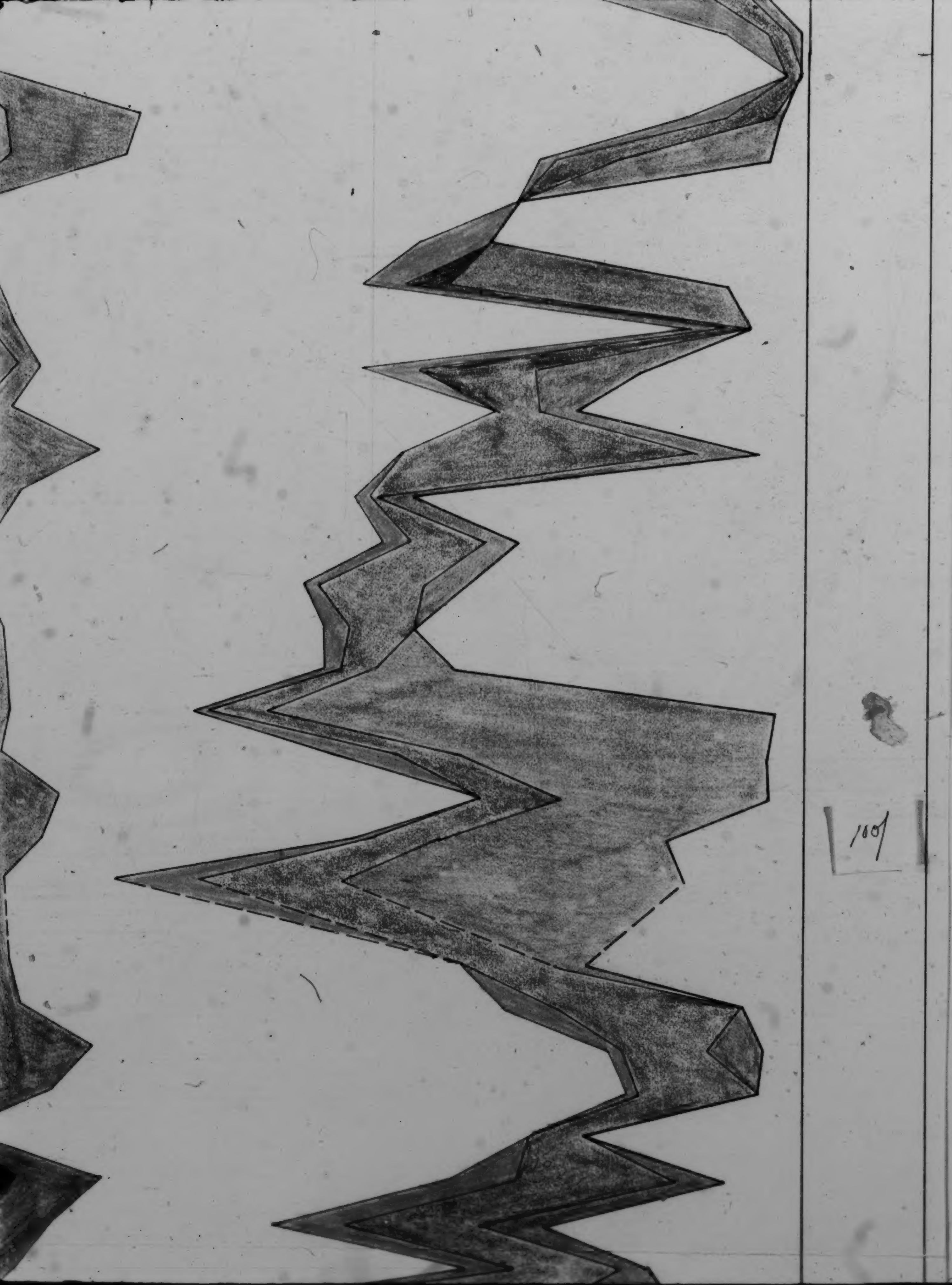
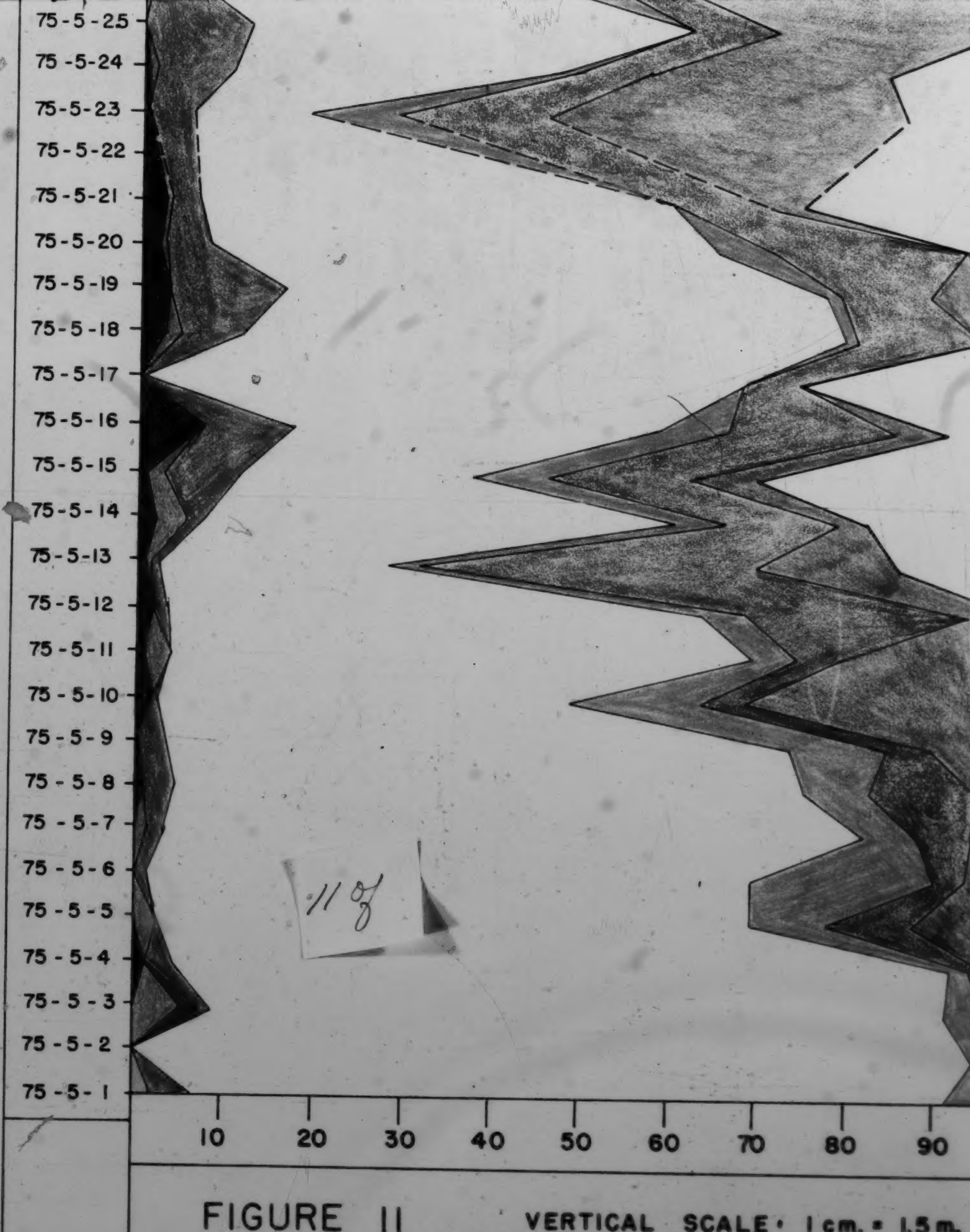
75-5-28
75-5-27
75-5-26
75-5-25
75-5-24
75-5-23
75-5-22
75-5-21
75-5-20
75-5-19
75-5-18
75-5-17
75-5-16

9of


100/



11 of

FIGURE 11 VERTICAL SCALE · 1 cm. = 1.5 m.

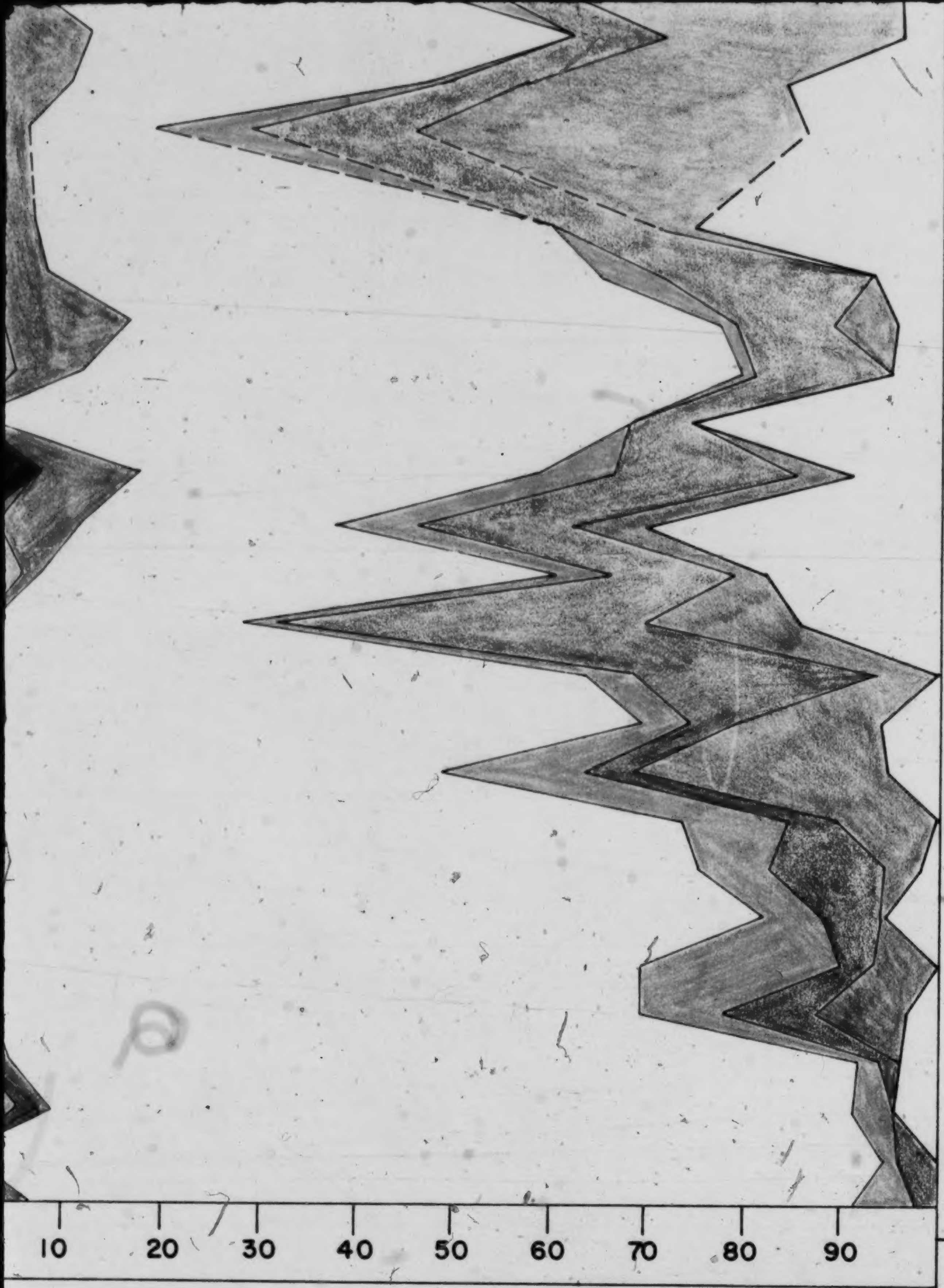


FIGURE 11 VERTICAL SCALE: 1 cm. = 1.5 m.

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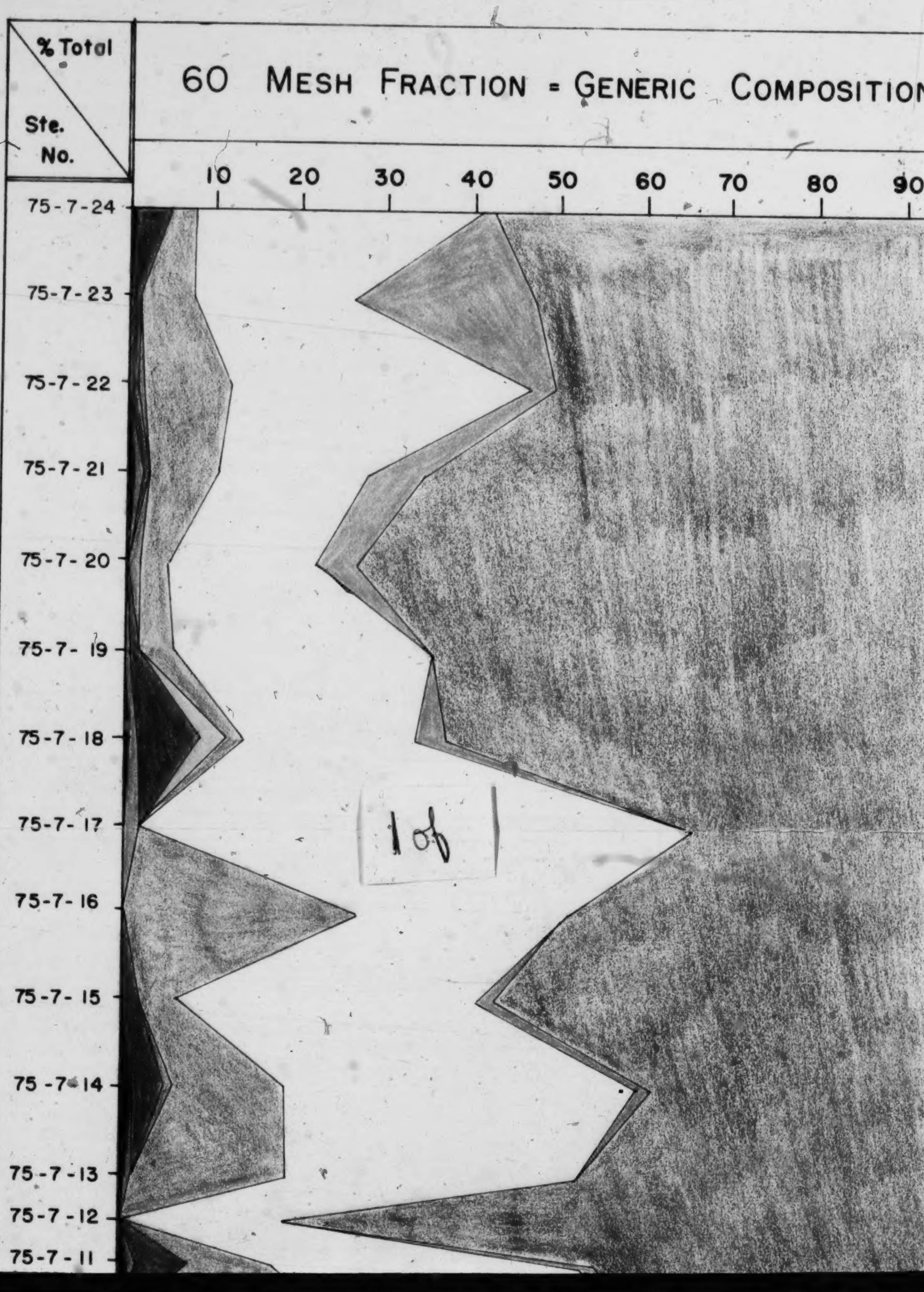
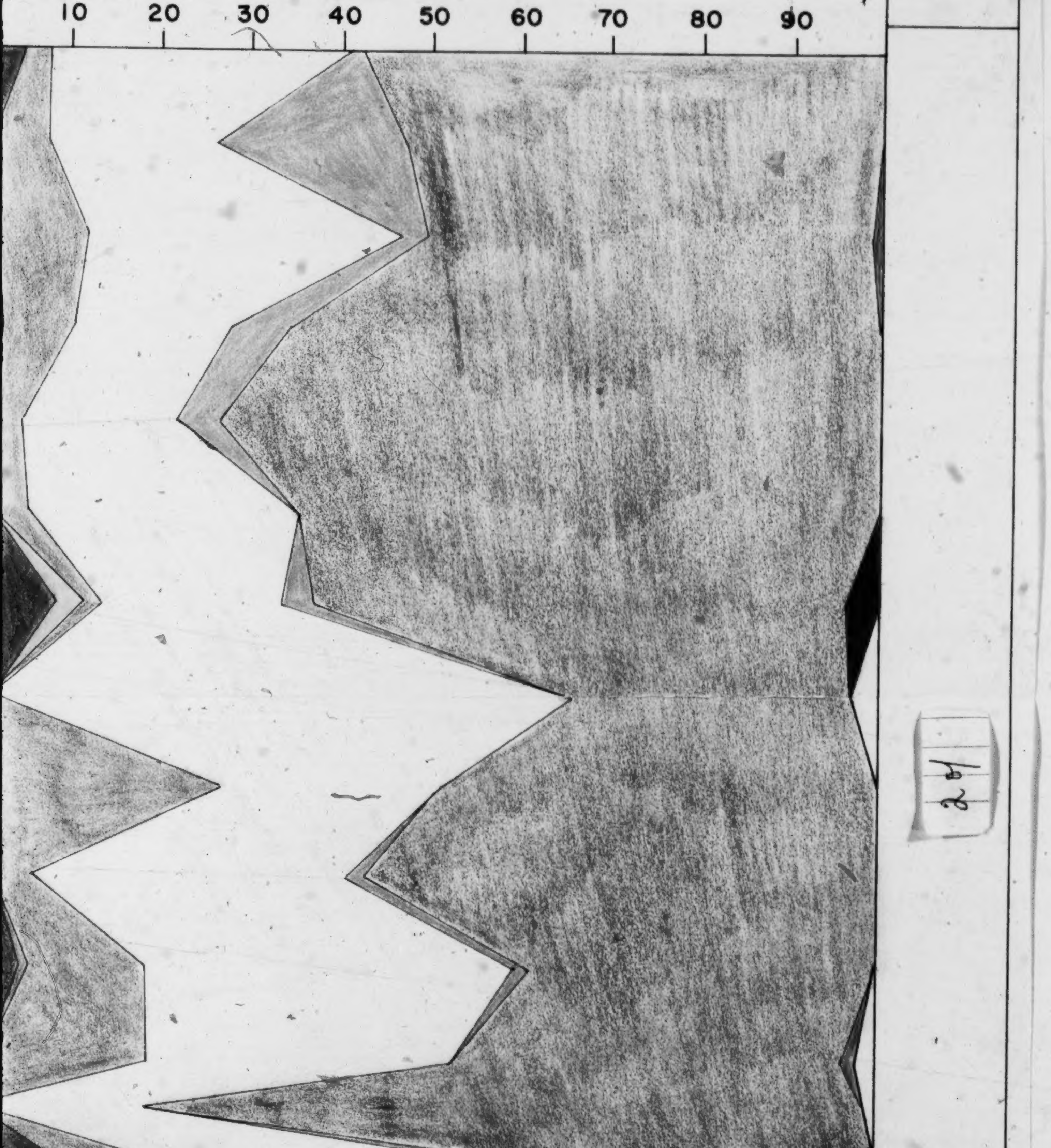
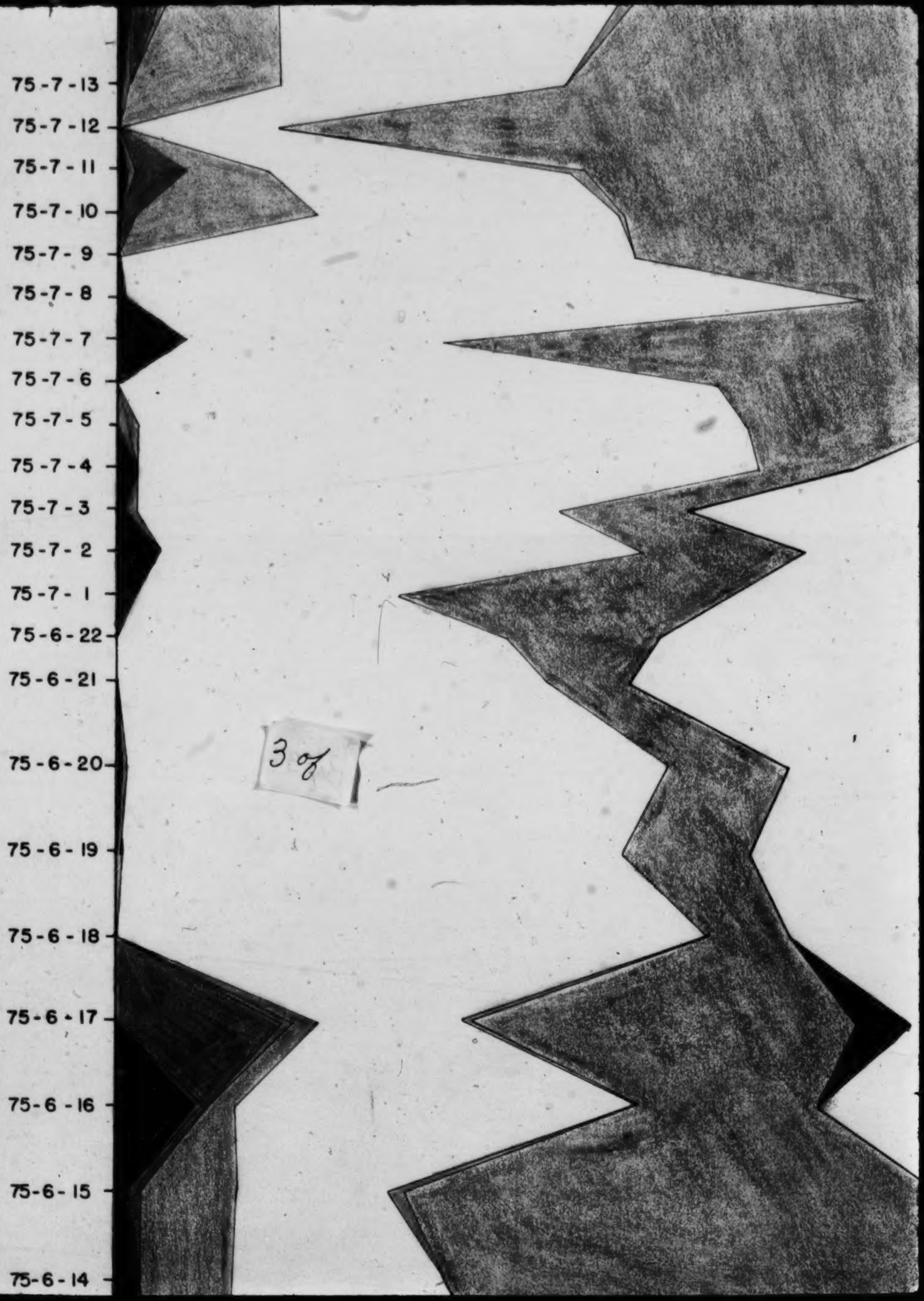

% Total
Ste. No.
60 MESH FRACTION = GENERIC COMPOSITION
10
20
30
40
50
60
70
80
90
75-7-24
75-7-23
75-7-22
75-7-21
75-7-20
75-7-19
75-7-18
75-7-17
75-7-16
75-7-15
75-7-14
75-7-13
75-7-12
75-7-11

1 of

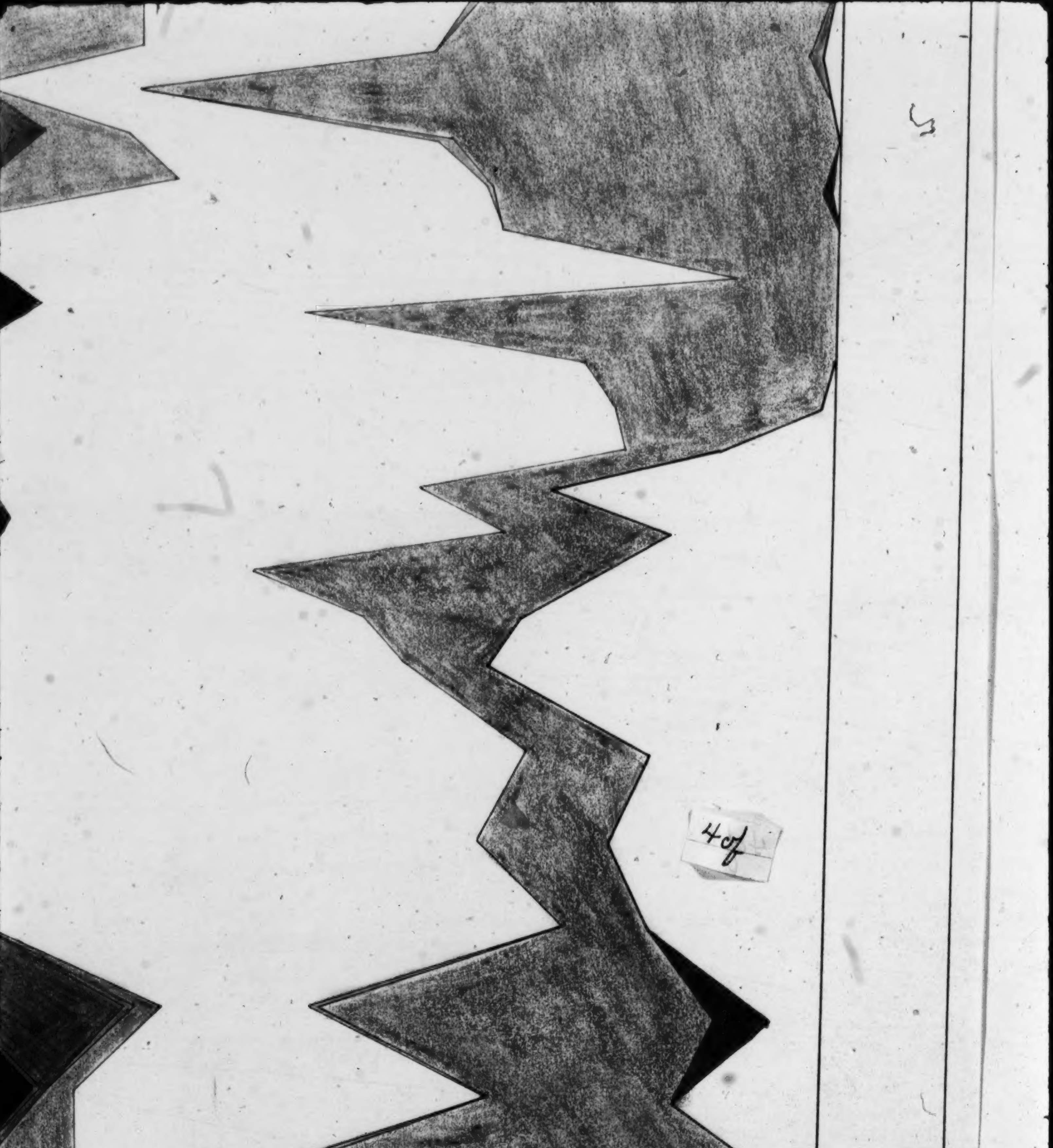
75-6-10

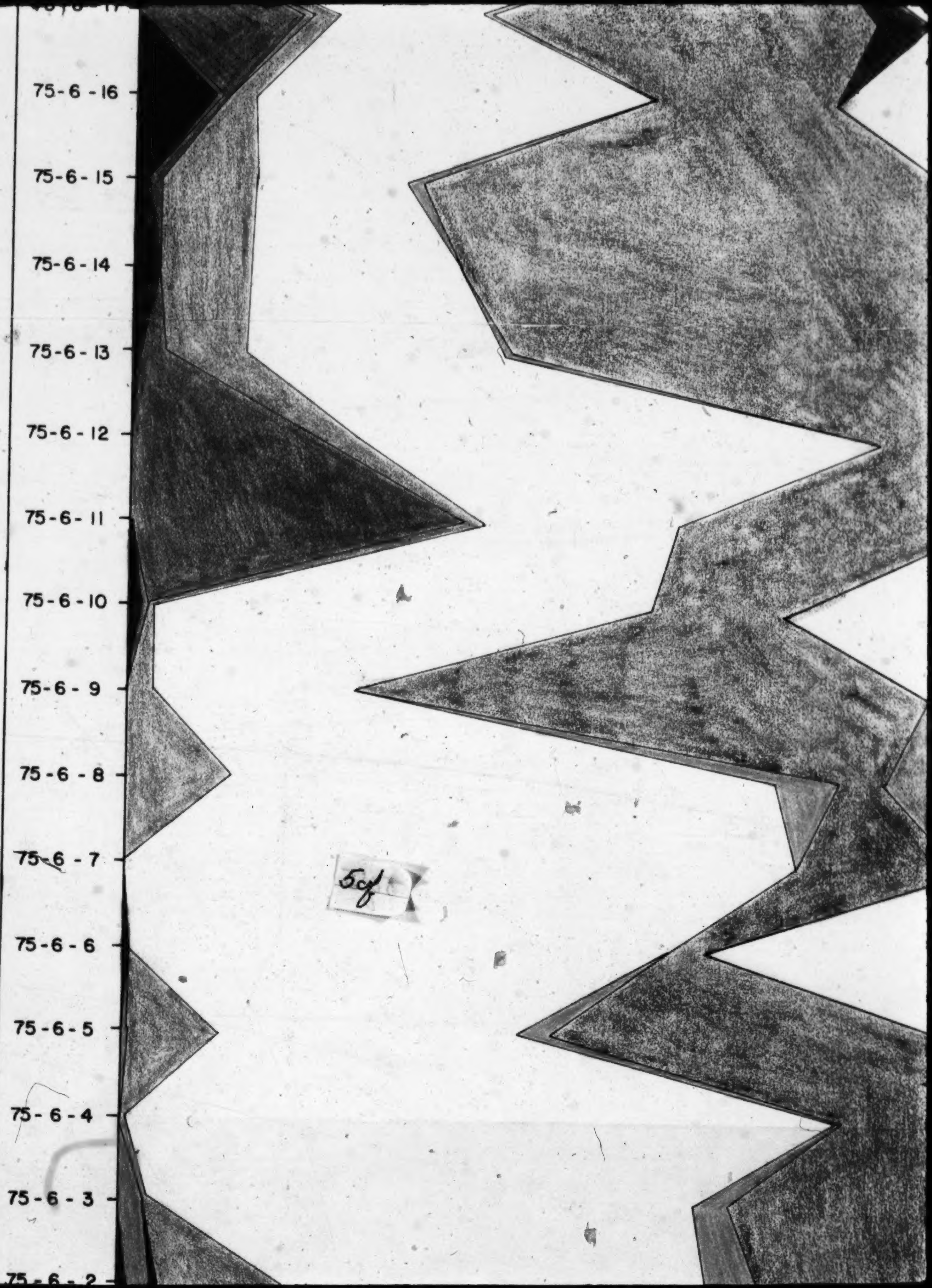
60 MESH FRACTION = GENERIC COMPOSITION



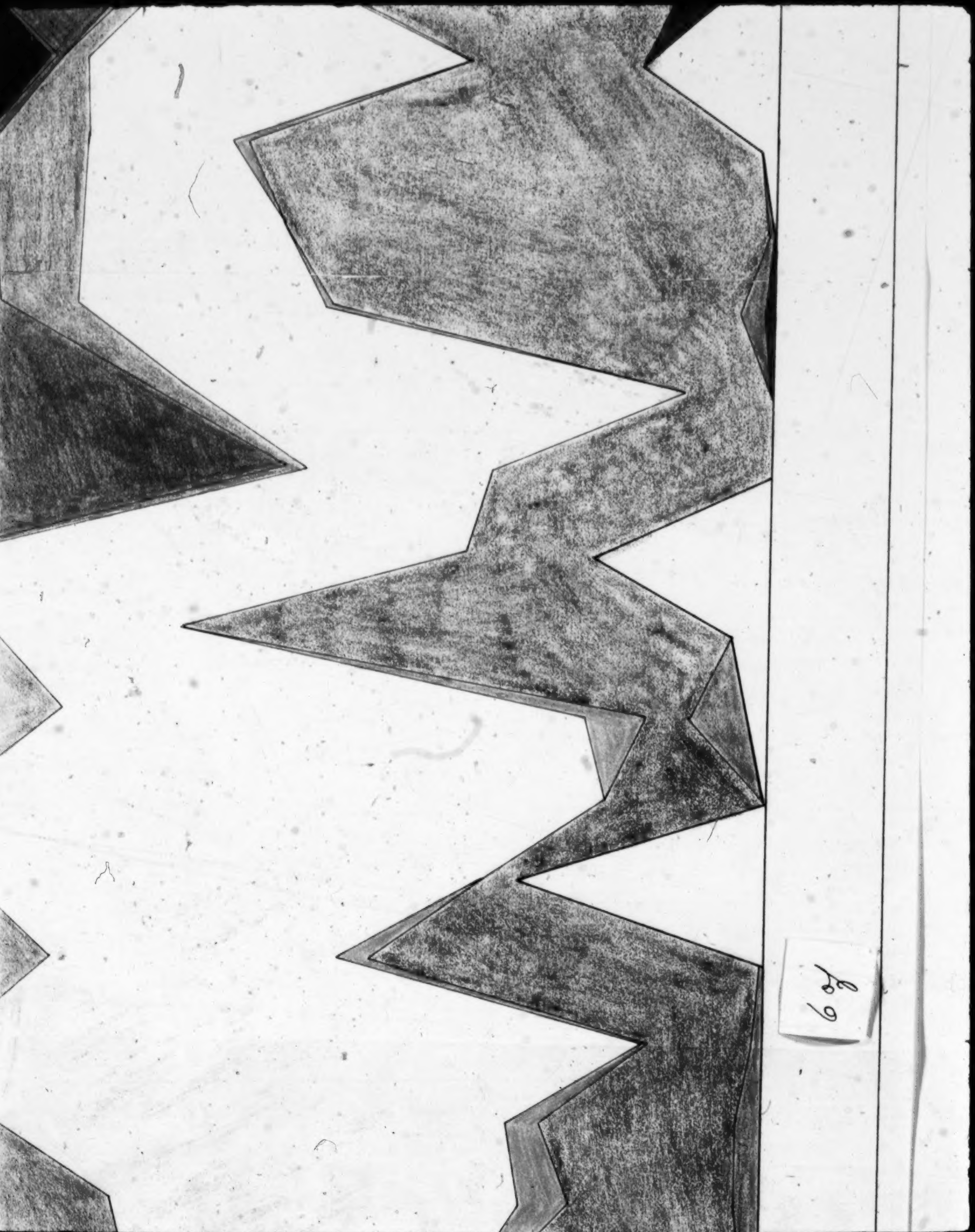

75-7-13
75-7-12
75-7-11
75-7-10
75-7-9
75-7-8
75-7-7
75-7-6
75-7-5
75-7-4
75-7-3
75-7-2
75-7-1
75-6-22
75-6-21
75-6-20
75-6-19
75-6-18
75-6-17
75-6-16
75-6-15
75-6-14

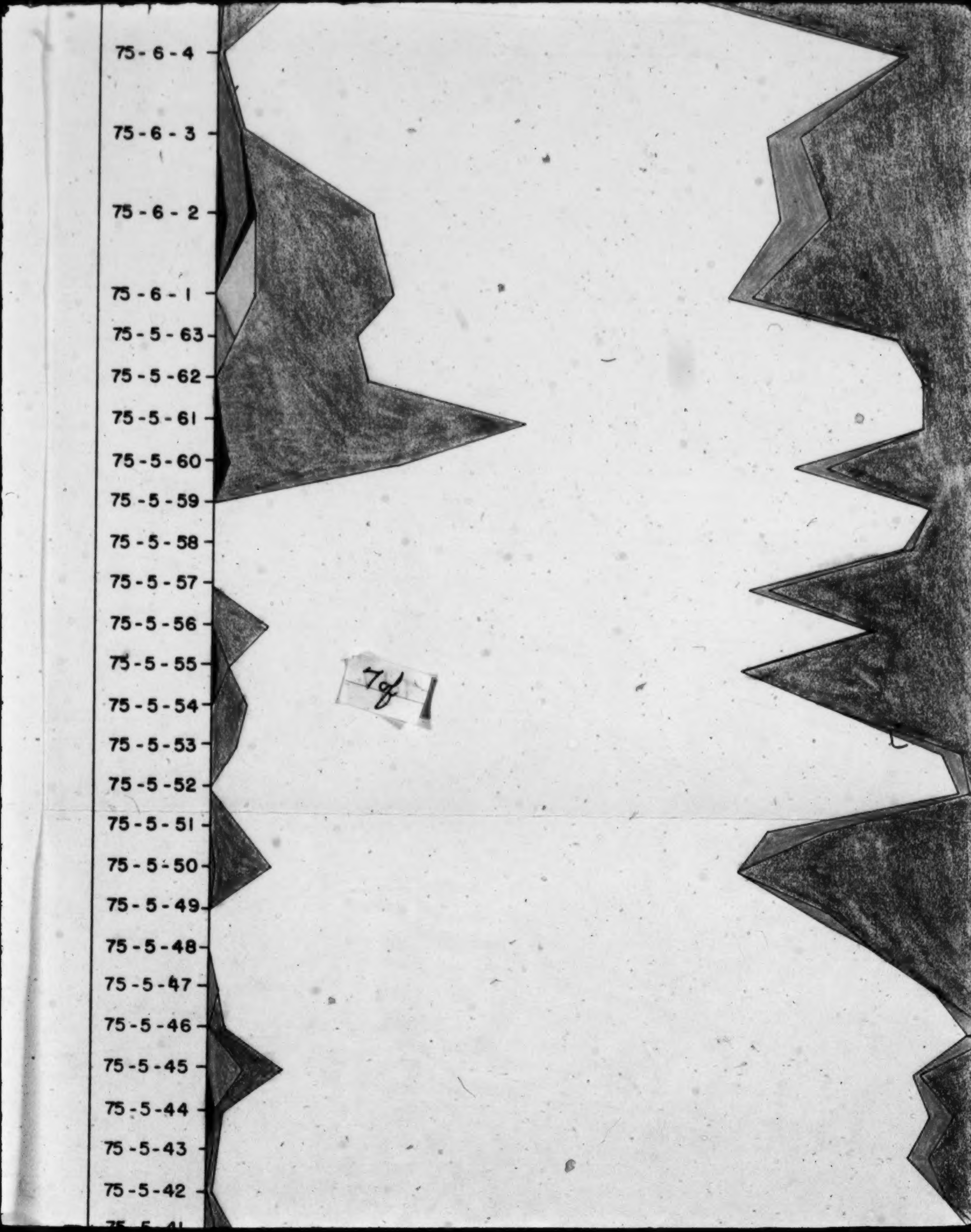
3 of


4 of


75-6-16
75-6-15
75-6-14
75-6-13
75-6-12
75-6-11
75-6-10
75-6-9
75-6-8
75-6-7
75-6-6
75-6-5
75-6-4
75-6-3
75-6-2
5cf

5


69


75-6-4
75-6-3
75-6-2
75-6-1
75-5-63
75-5-62
75-5-61
75-5-60
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75-5-58
75-5-57
75-5-56
75-5-55
75-5-54
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75-5-51
75-5-50
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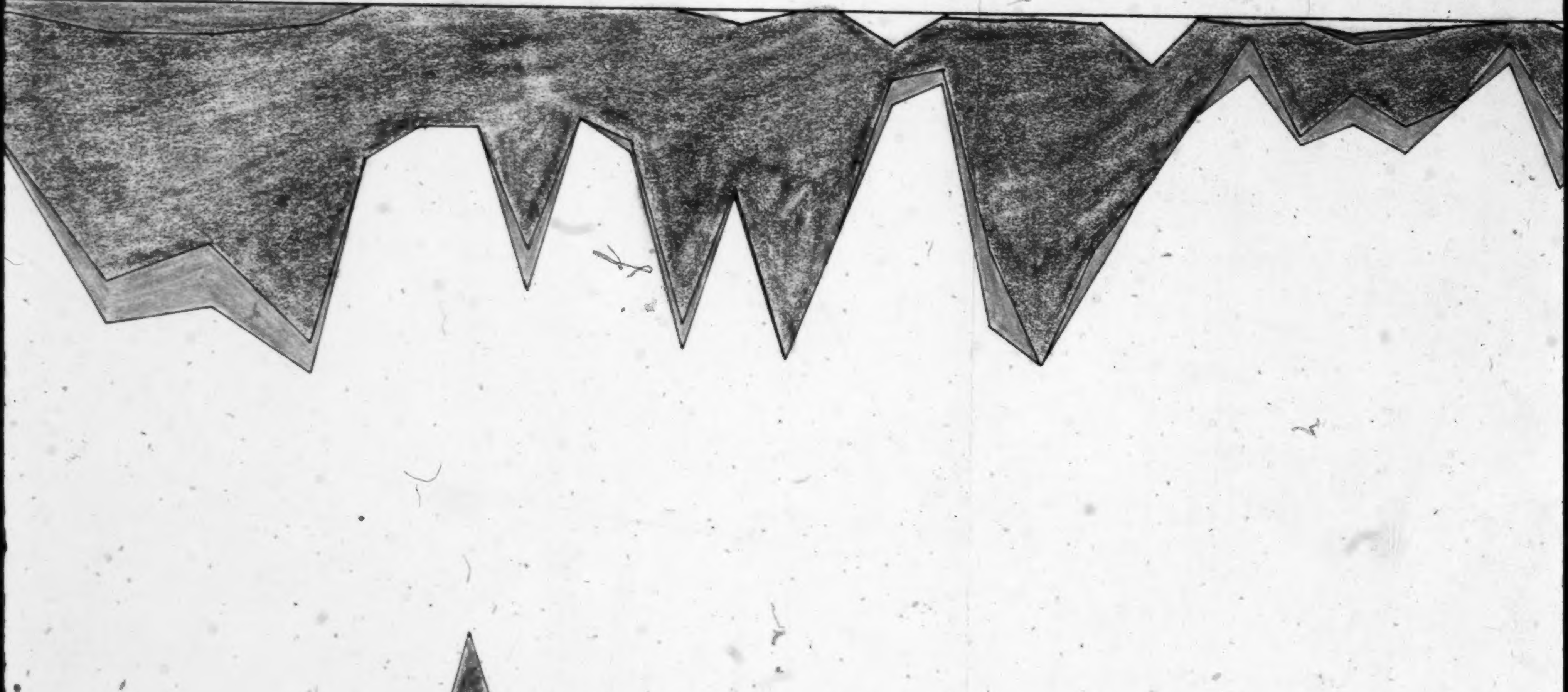
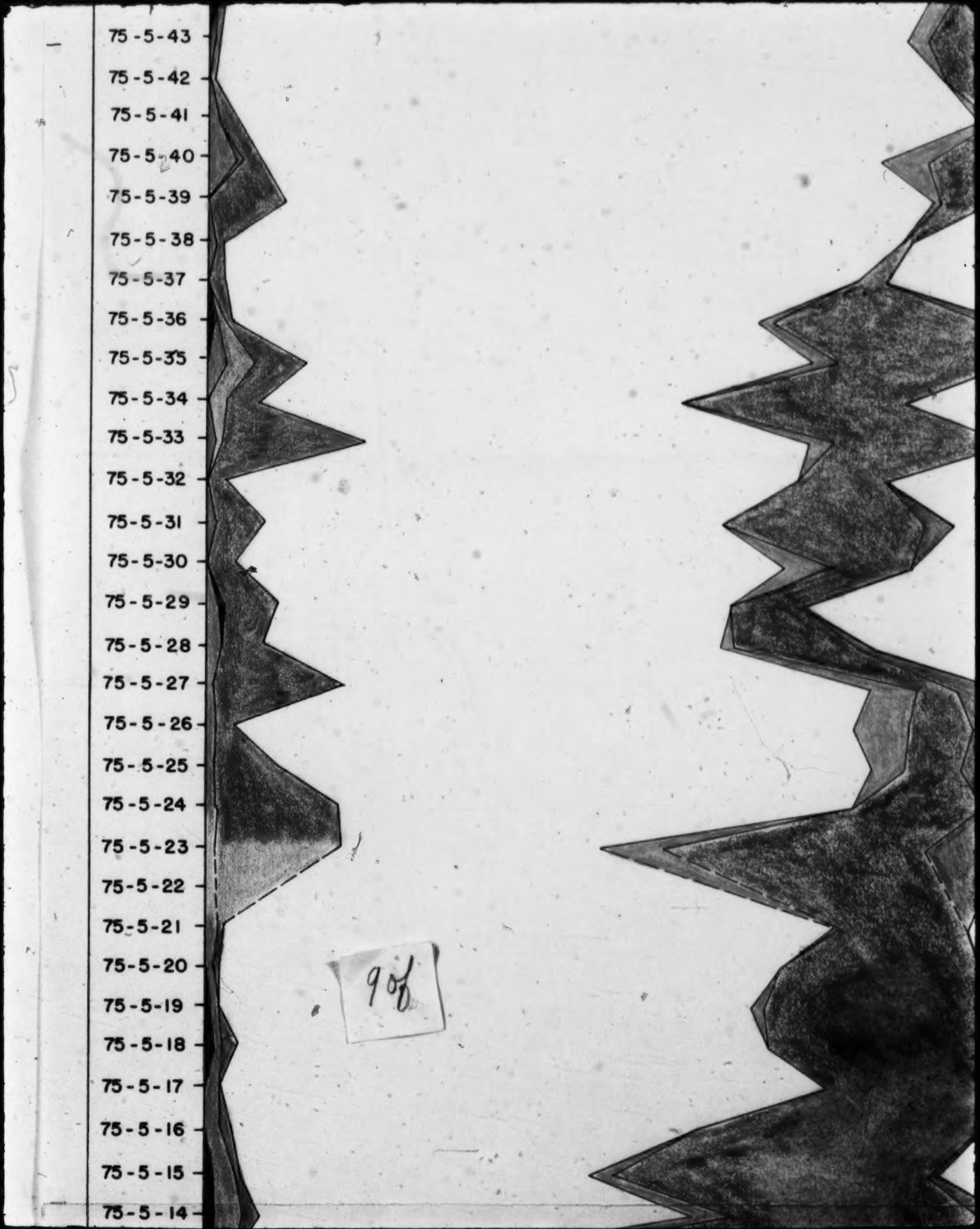
75-5-43
75-5-42
7of

18




75-5-43
75-5-42
75-5-41
75-5-40
75-5-39
75-5-38
75-5-37
75-5-36
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75-5-34
75-5-33
75-5-32
75-5-31
75-5-30
75-5-29
75-5-28
75-5-27
75-5-26
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75-5-24
75-5-23
75-5-22
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75-5-19
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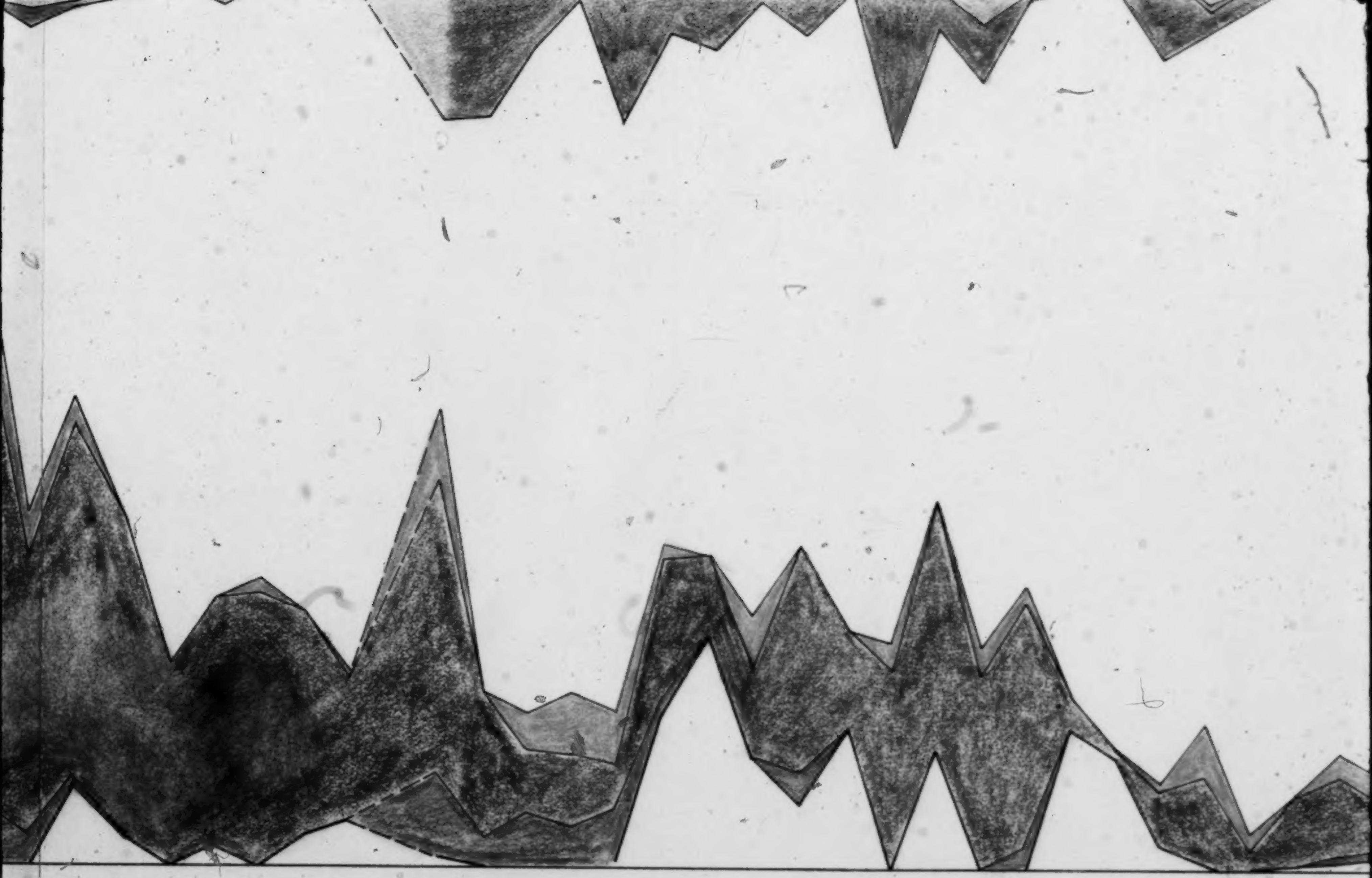
75-5-16
75-5-15
75-5-14

9of



189

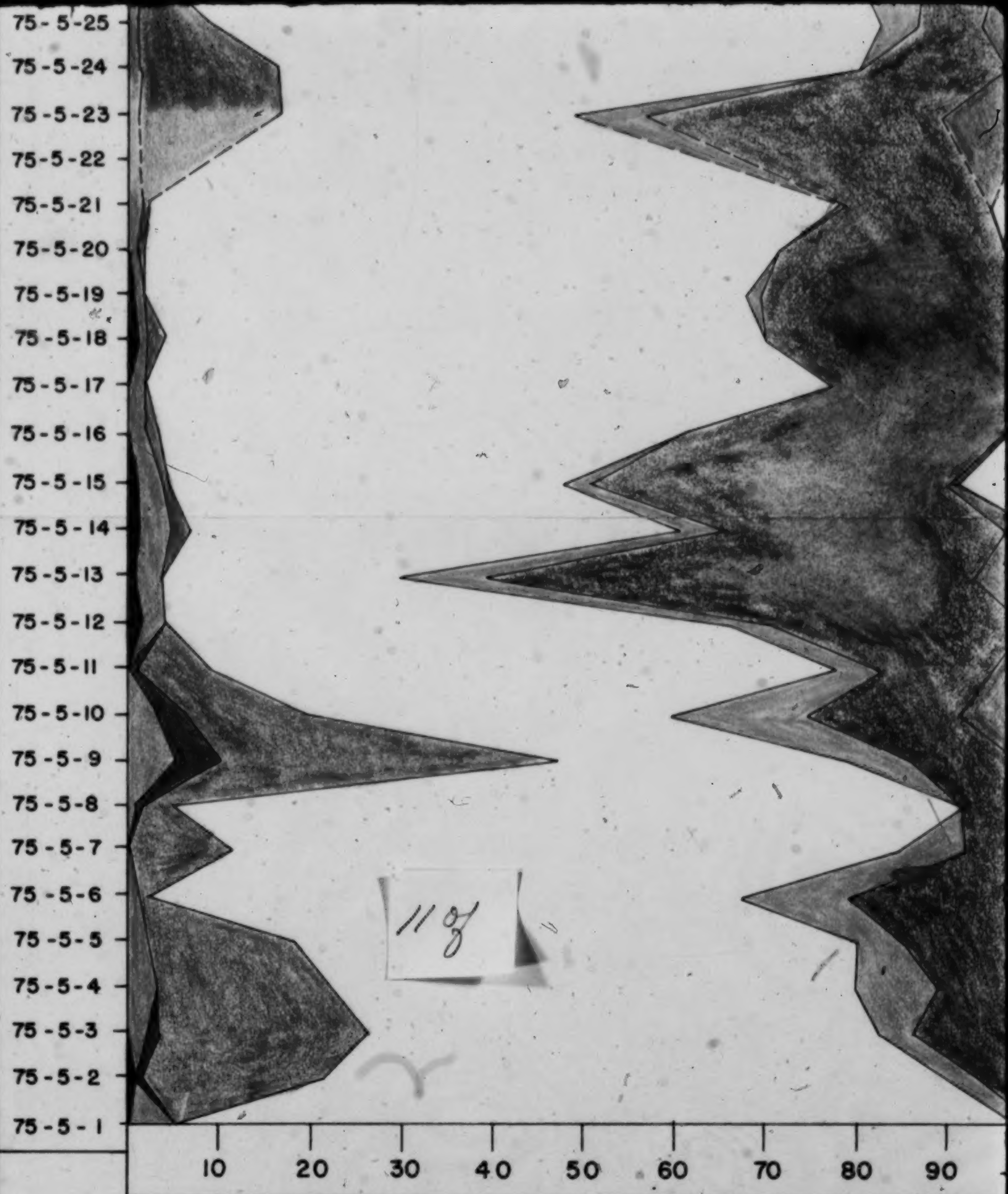


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FIGURE 10

VERTICAL SCALE: 1cm. = 1.5m.

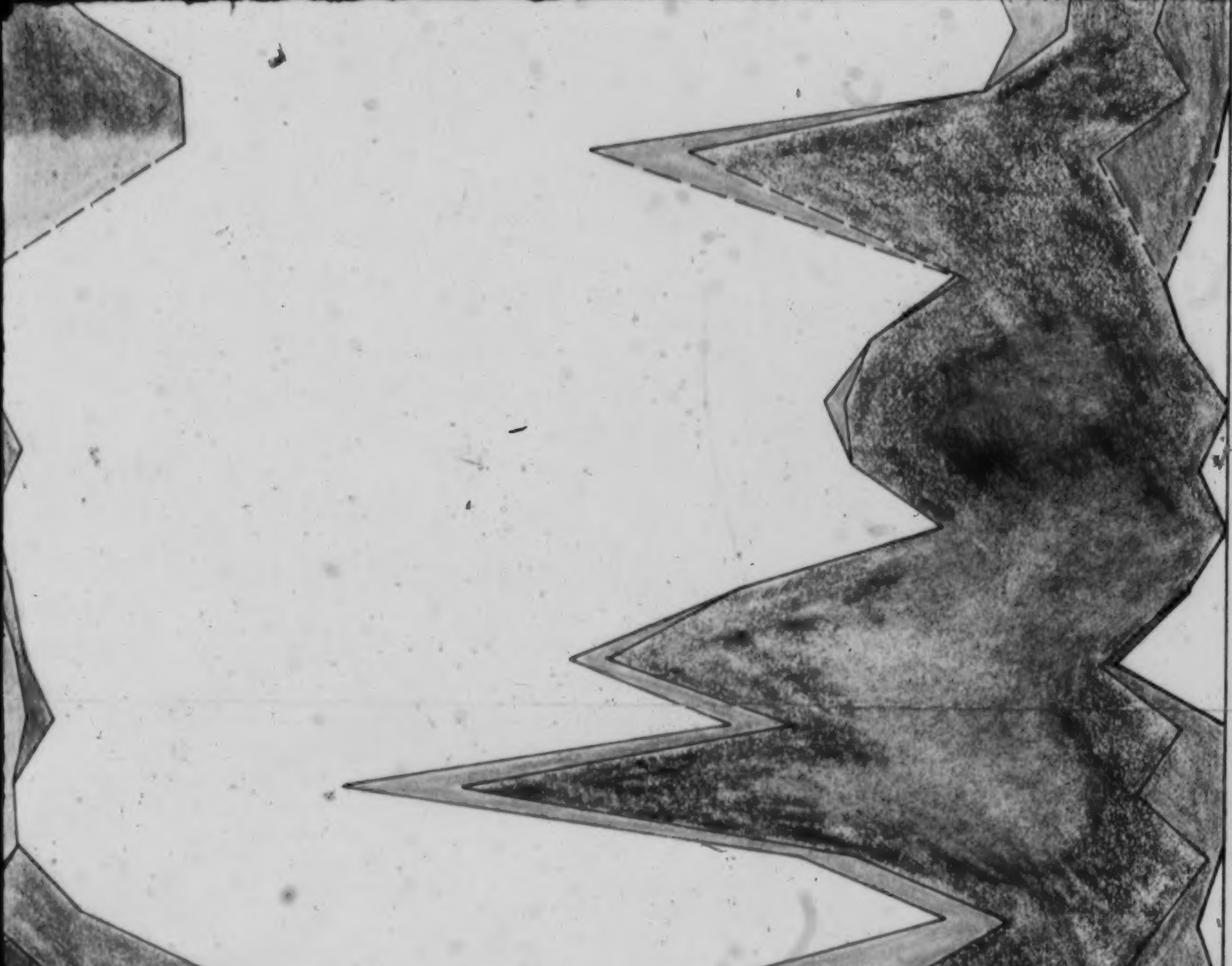
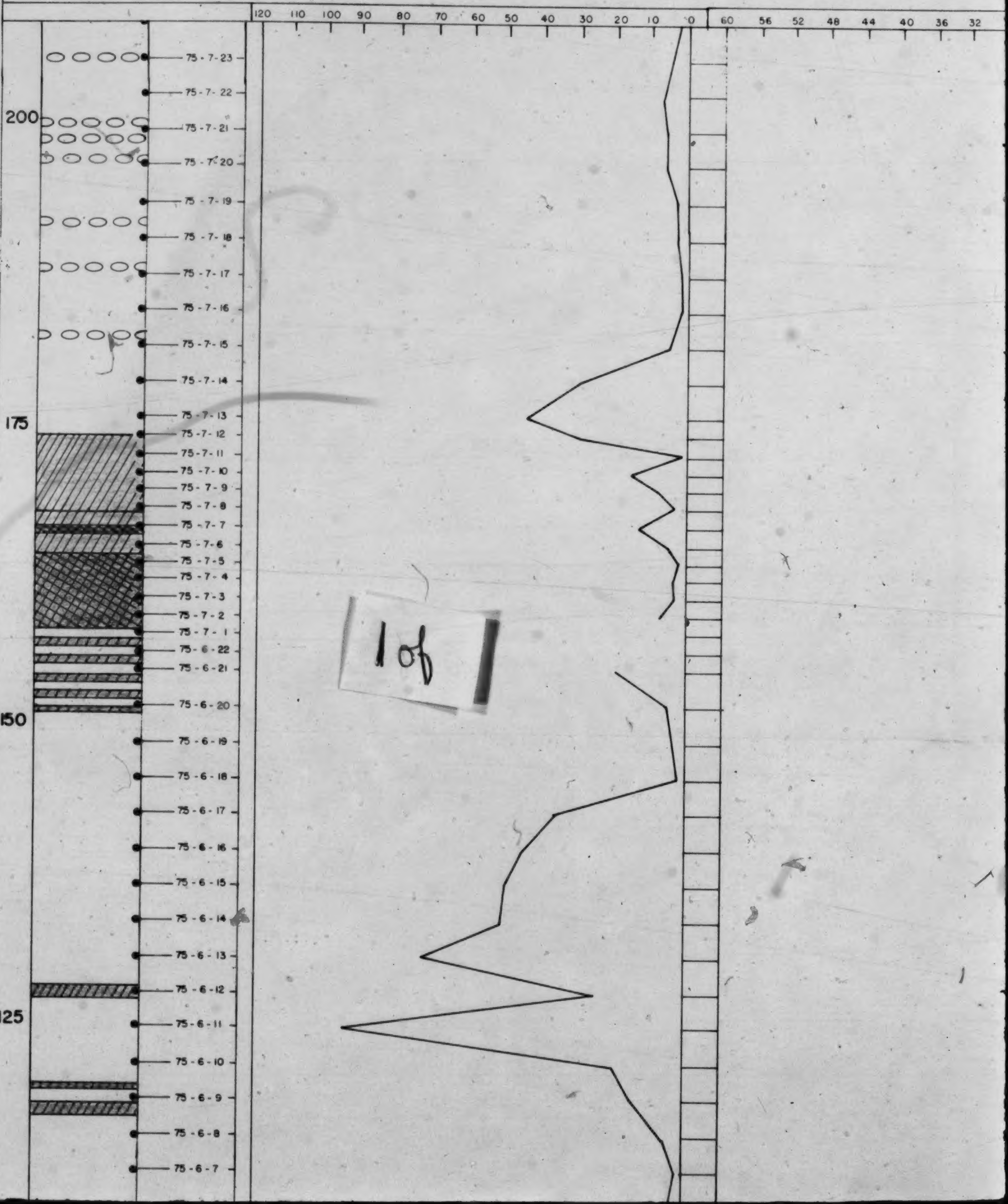


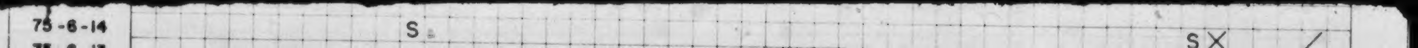
FIGURE 10 VERTICAL SCALE: 1cm. = 1.5m.

12 8/12

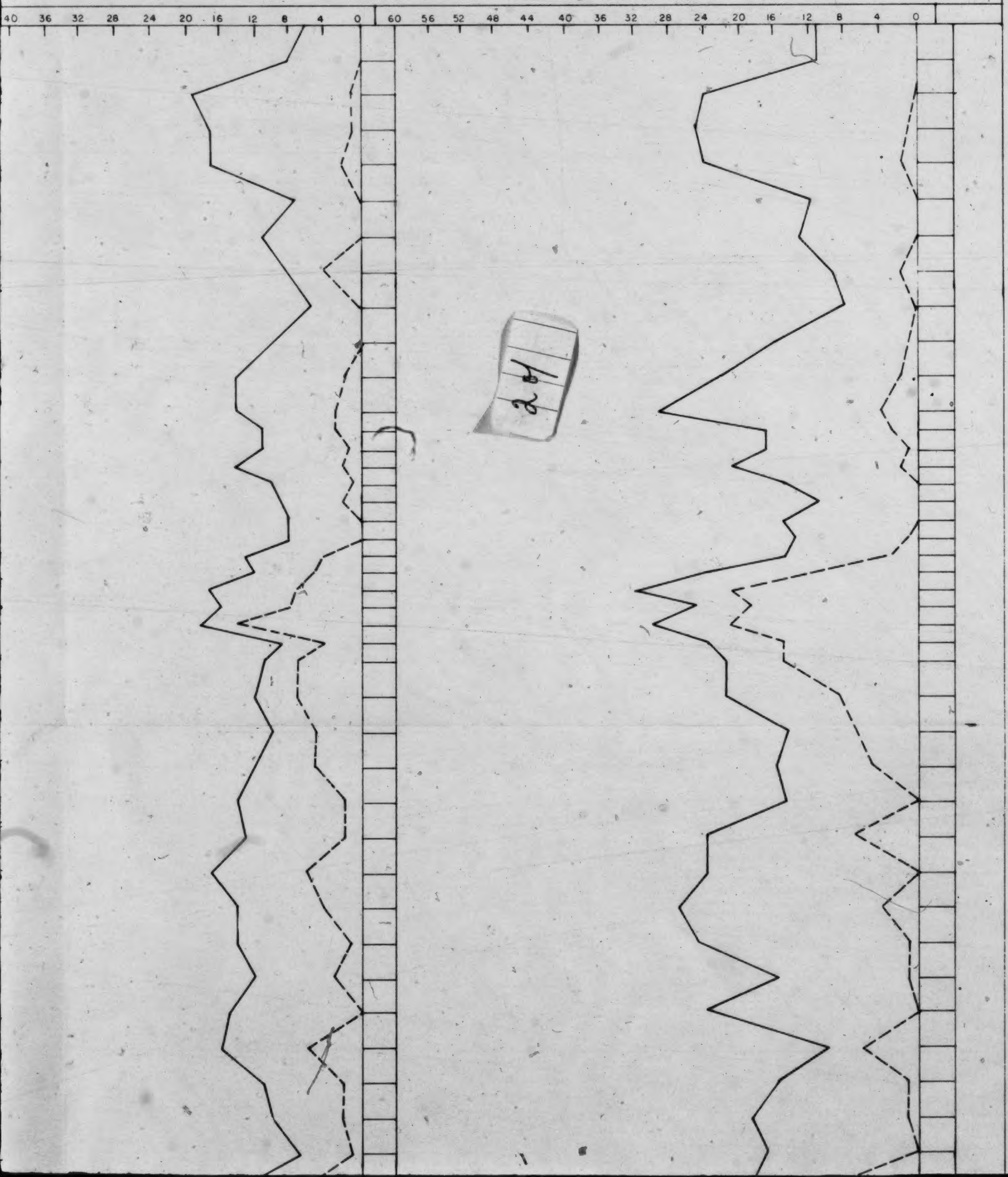
FIGURE 9 GRAPH RELATING LITHOLOGY, FORAMINIFERA



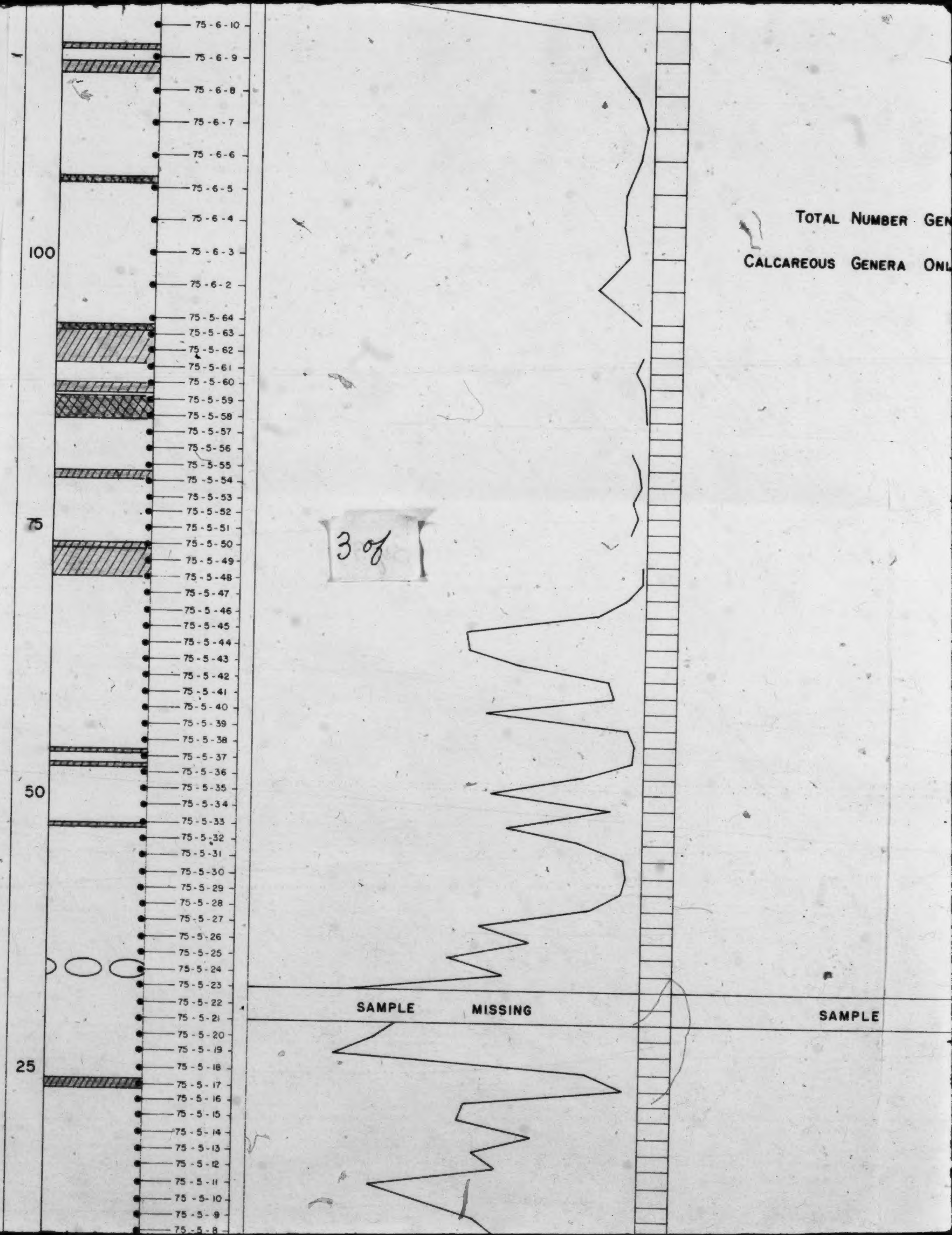
1of



RAMINIFERAL NUMBER, GENERIC DIVERSITY and SPECIES DIVERSITY



75-6-13
75-6-12
SX


75-6-10
75-6-9
75-6-8
75-6-7
75-6-6
75-6-5
75-6-4
100
75-6-3
75-6-2
75-5-64
75-5-63
75-5-62
75-5-61
75-5-60
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75-5-42
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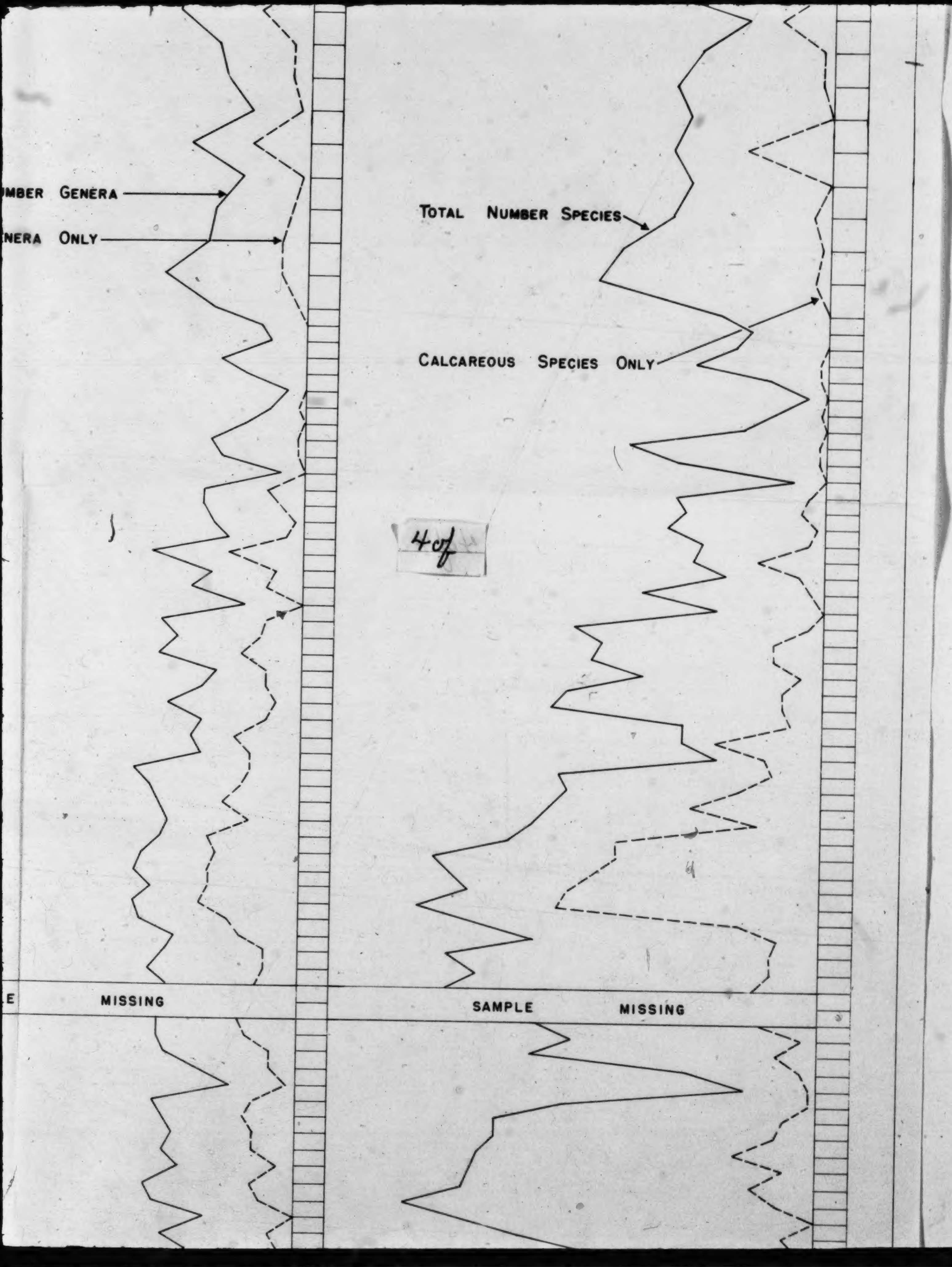
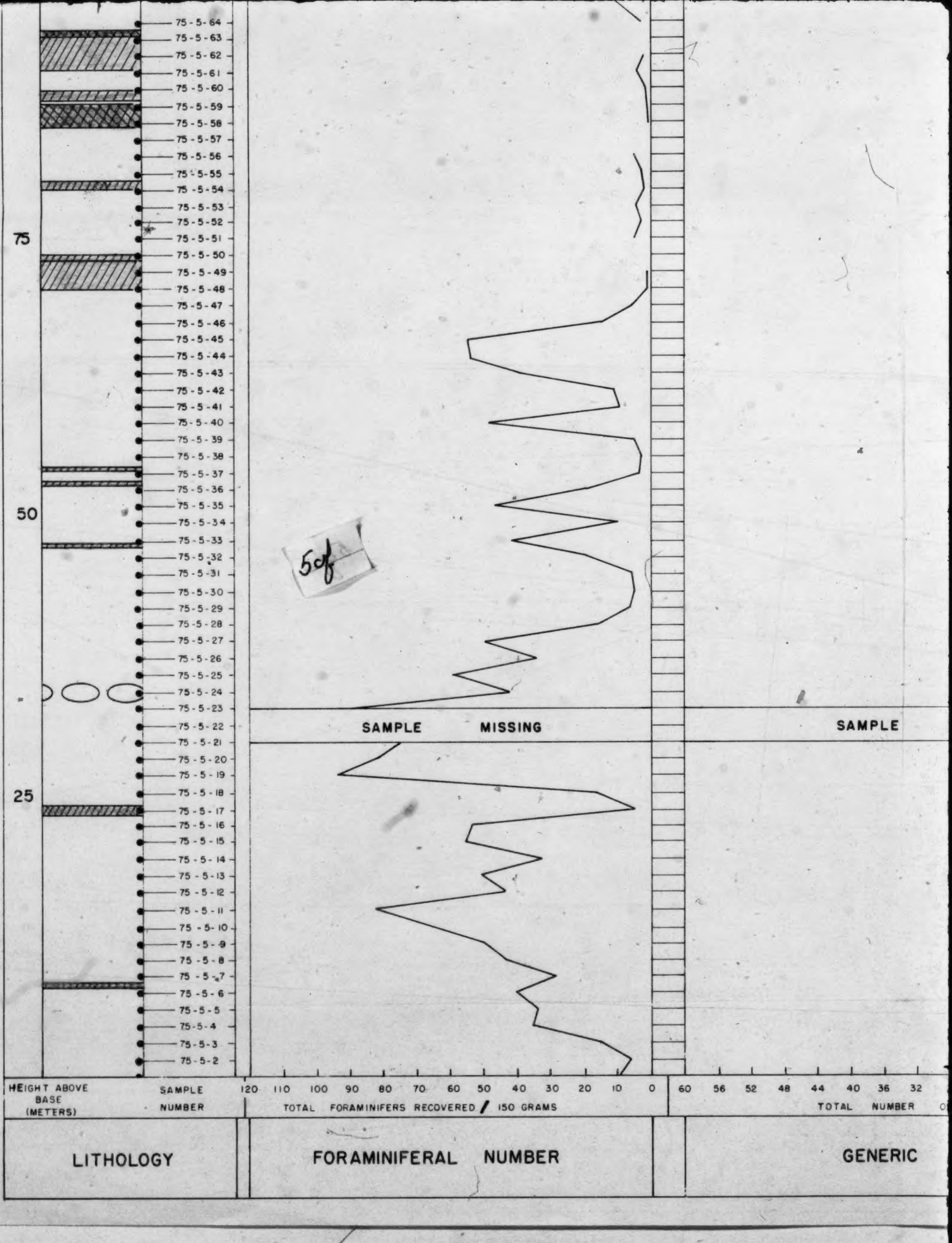
75-5-15
75-5-14
75-5-13
75-5-12
75-5-11
75-5-10
75-5-9
75-5-8
SAMPLE MISSING
SAMPLE
TOTAL NUMBER GEN
CALCAREOUS GENERA ONL

3 of


UMBER GENERA
ENERA ONLY
TOTAL NUMBER SPECIES
CALCAREOUS SPECIES ONLY
E MISSING
SAMPLE MISSING

4 of

75-6-14


75-5-64
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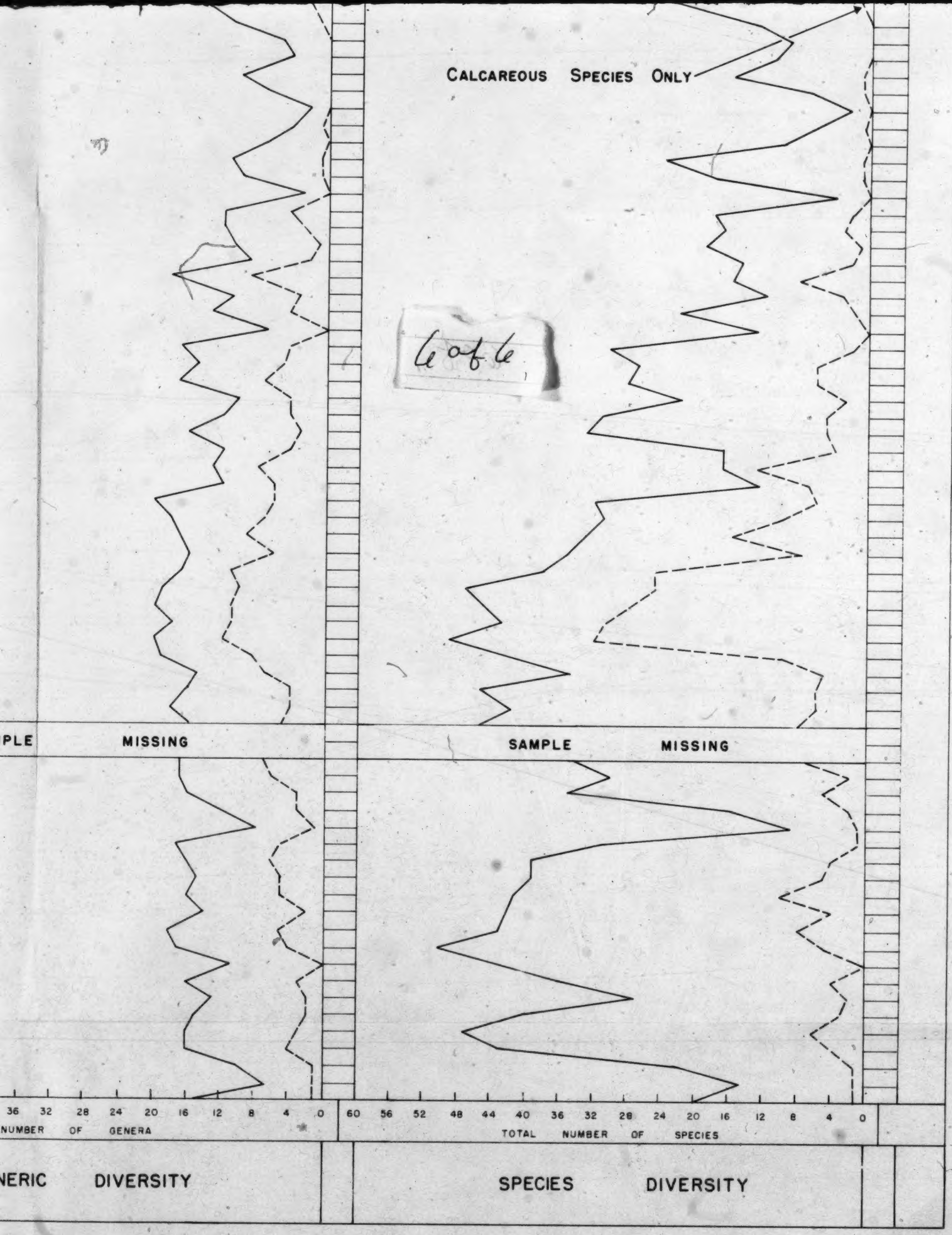
75-5-11
75-5-10
75-5-9
75-5-8
75-5-7
75-5-6
75-5-5
75-5-4
75-5-3
75-5-2
75
50
25
5cf
SAMPLE MISSING
SAMPLE
HEIGHT ABOVE BASE (METERS)
SAMPLE NUMBER
120 110 100 90 80 70 60 50 40 30 20 10 0
TOTAL FORAMINIFERS RECOVERED / 150 GRAMS
60 56 52 48 44 40 36 32
TOTAL NUMBER
LITHOLOGY
FORAMINIFERAL NUMBER
GENERIC


CALCAREOUS SPECIES ONLY
PLE MISSING
SAMPLE MISSING
36 32 28 24 20 16 12 8 4 0
NUMBER OF GENERA
60 56 52 48 44 40 36 32 28 24 20 16 12 8 4 0
TOTAL NUMBER OF SPECIES
NERIC DIVERSITY
SPECIES DIVERSITY

6 of 6

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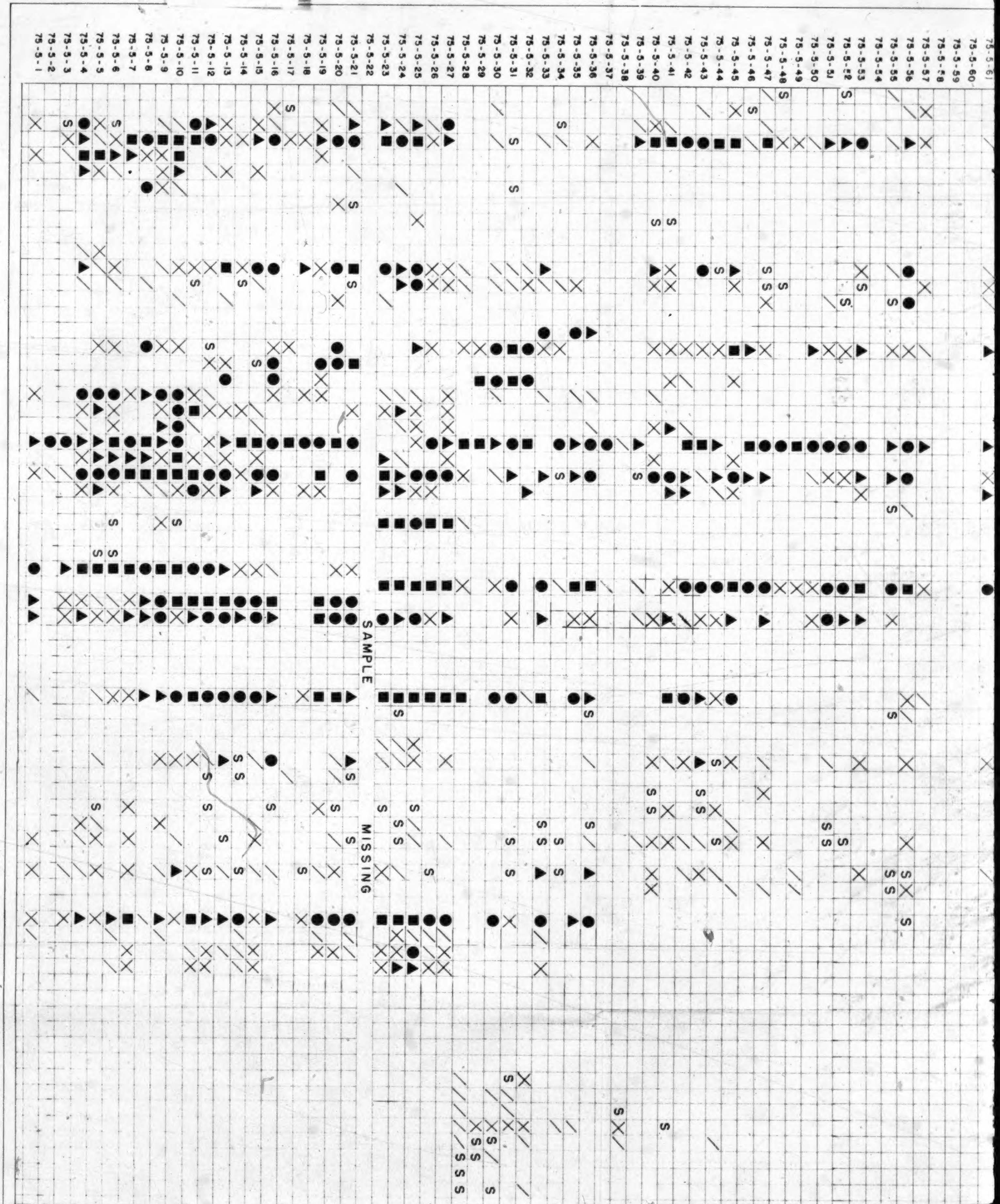
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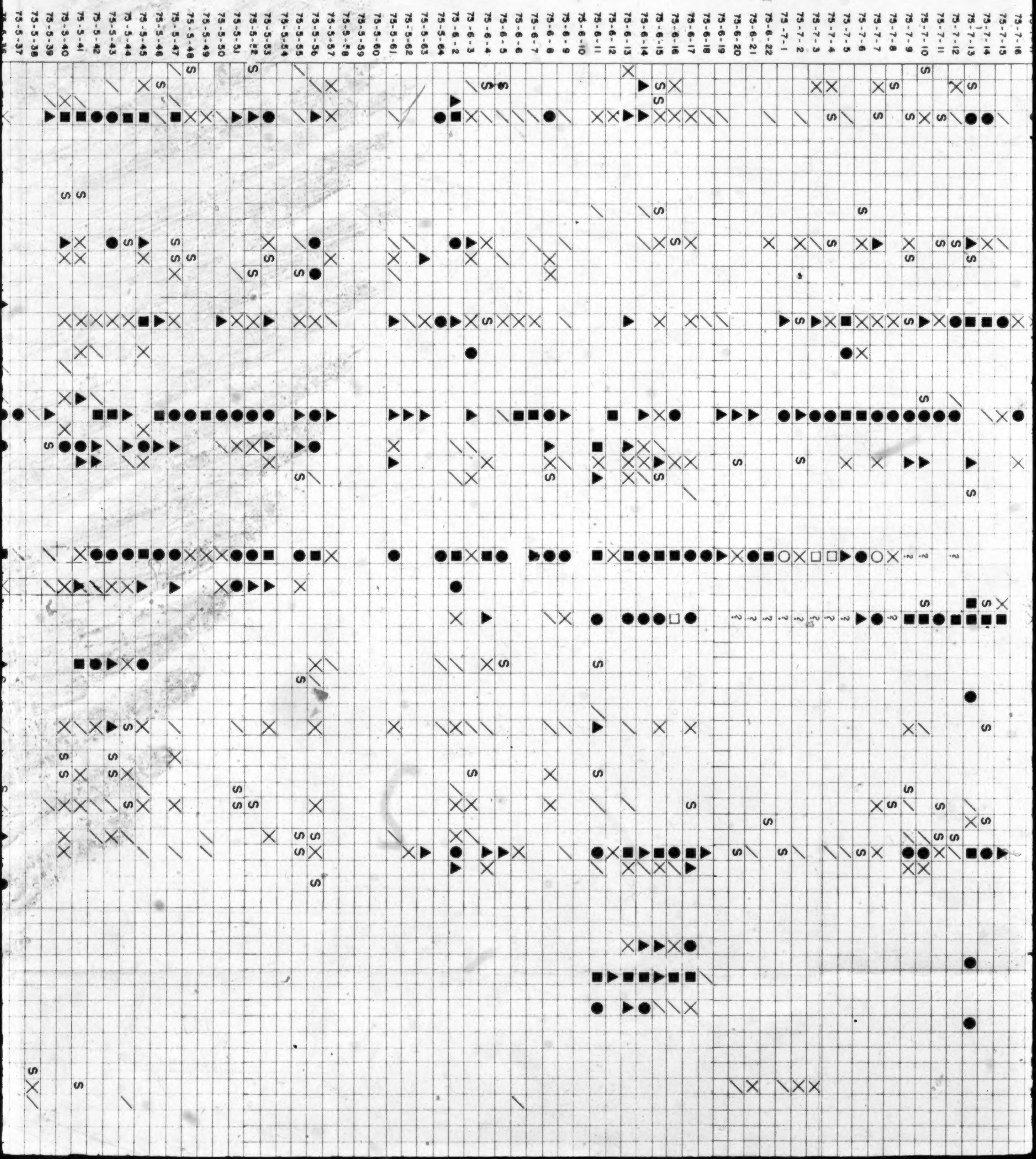


A. sp. cf. A. cherdodospirus LOEBLICH & TAPPAN

A. sp. cf. A. siliceo TERQUEM

A. sp. 7-18

3 of

TABLE 2 DISTRIBUTION CHART, 100 and 200 Mesh Fractions

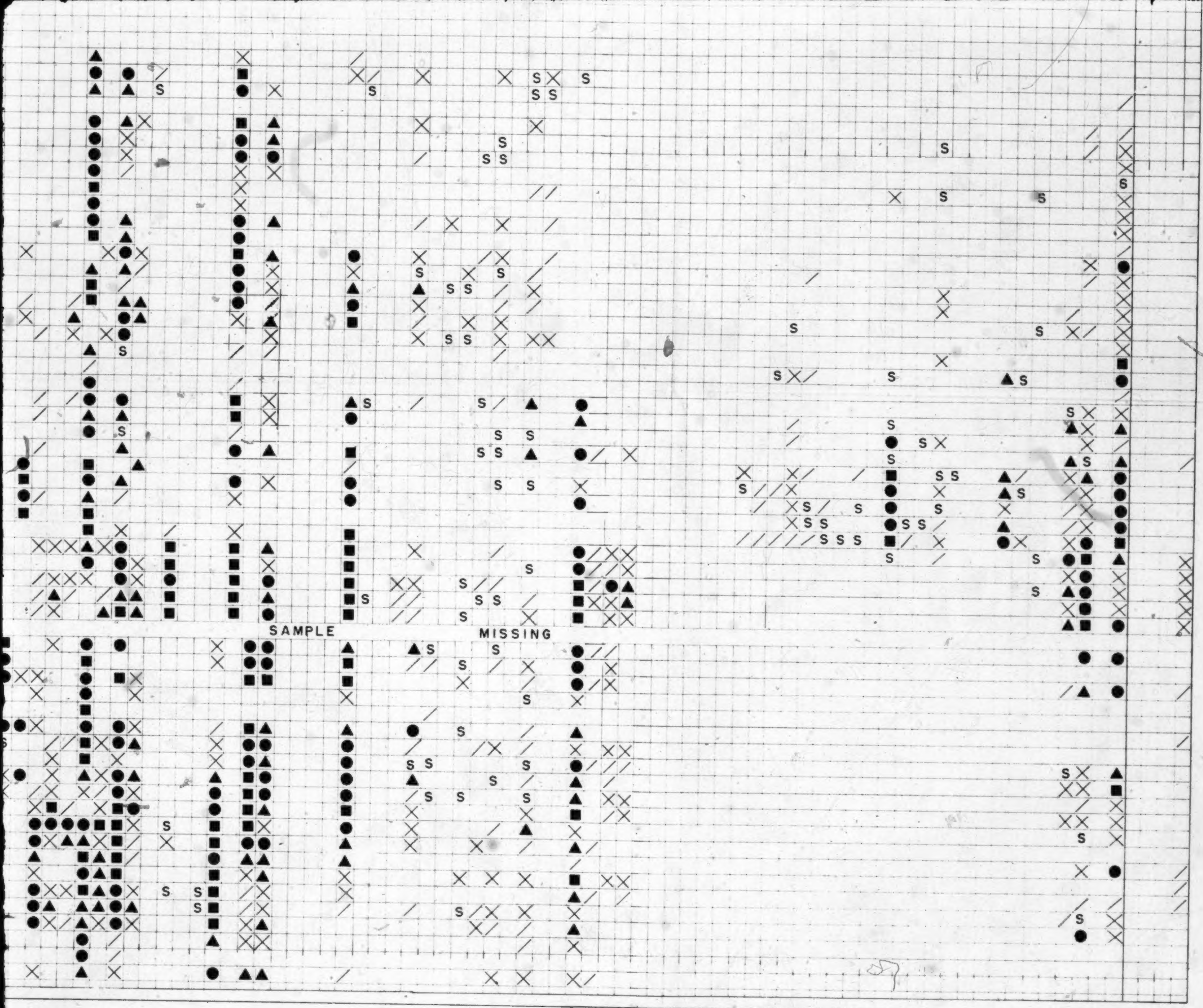
SAMPLE NO.	75-6-13	75-6-14	75-6-15	75-6-16	75-6-17	75-6-18	75-6-19	75-6-20	75-6-21	75-6-22	75-7-1	75-7-2	75-7-3	75-7-4	75-7-5	75-7-6	75-7-7	75-7-8	75-7-9	75-7-10	75-7-11	75-7-12	75-7-13	75-7-14	75-7-15	75-7-16	75-7-17	75-7-18	75-7-19	75-7-20	75-7-21	75-7-22
Bathysiphon sp.	X																			S								X		X	X	╲
Saccammina sp.		▶	S	X									X	X			X	S				X	S									S
Ammodiscus sp. cf. A. francisi WALL			S																													
A. sp. cf. A. orbis LALICKER	▶	▶	X	X	X	╲	╲			╲		╲		S	╲		S		S	X	S	╲	●	●	╲		S			●	●	■
Glomospira sp. cf. G. glomerosa EICHER																																
G. sp. cf. G. tortuosa EICHER																															X	X
Glomospirella sp. 5-8																																
Turritellella sp. 5-20																																
T. sp. 5-25																																
Arenoturrispirillina sp. cf. A. jeletzkii CHAMNEY		╲	S													S																
Lituotuba sp. 5-5																																
Reophax minuta TAPPAN		╲	X	S	X					X		X	╲	S		X	▶		X		S	S	▶	X	╲					X	X	X
R. sp. 5-25																			S				S									
R. sp.																																
R. sp. indet.																																
Ammobaculites sp. 5 - 35																																
A. spp.	▶		X		X	╲	╲				▶	S	▶	X	■	X	X	X	S	▶	X	●	■	■	●	X	X	●	▶	X	X	X
Haplophragmium pokrovkaensis KOSYREVA																																
H. spp.															●	X																
Haplophragmoides sp. cf. H. tryssa LOEBLICH & TAPPAN																																
H. sp. cf. H. tryssa LOEBLICH & TAPPAN var. 1																																
H. sp. cf. H. tryssa LOEBLICH & TAPPAN var. 2																				S		╲										
Cribrostomoides sp. indet.		▶	X	●			▶	▶	▶		●	▶	●	●	■	■	●	●	●	●	●	●		╲	X	●			●	╲	X	■
Recurvoides canningensis (TAPPAN)																																
R. sp. 5- 11	▶	X	╲																													
R. spp. (juv.)	X	X	▶	X	X			S				S			X		X		▶	▶			▶			X				●	X	▶
Trochamminoides sp. 6 - 13	X	╲	S																											S		
Trochammina sp. cf. T. elevata DAIN					╲																		S									
T. sp. cf. T. elevata DAIN subsp. 1																																
T. kosyrevae LEVINA (juv.)																																
T. omskensis KOSREVA																																
T. sp. 5 - 25	■	●	■	■	●	●	▶	X	●	■	○	X	□	□	▶	●	○	X	?	?		?										
T. sp. 5 - 13																																
T. sp. 5 - 27																																
T. sp. 7 - 13A																				S			■	S	X							╲
T. sp. 7 - 13B	●	●	●	□	●			?	?	?	?	?	?	?	?	▶	●	?	■	■	●	■	■	■	■		X	X		X	X	X
T. sp. 7 - 20																														▶	▶	X
T. sp. 7 - 21																												X	X	■	■	■
Ammosphaerodina sp. 5 - 23																																
Ammobaculoides sp. 5 - 24																																
A. sp. 7 - 13																							●									
Spiroplectammina sp. 1																																
Textularia areoplecta TAPPAN	╲		X		X														X	╲				S						X	╲	╲
T. sp. 5 - 20																																
Pseudobolivina sp. 5 - 27																																
P. sp. 5 - 19																																
Siphotextularia sp. 5 - 4																			S													
S. sp. 5 - 5	╲				S												X	S	╲		S		╲							S	╲	S
S. sp. 7 - 13										S													X	S								S
S. sp. 5 - 10																			╲	╲	S	S								╲	╲	
Verneuilina sp. cf. V. anglica CUSHMAN var. 1	■	▶	■	●	■	▶		S	╲		S	╲		╲	╲	S	X		●	●	X	╲	■	●	▶					X	X	▶
V. sp. cf. V. anglica CUSHMAN var. 2	X	╲	X	╲	▶														X	X												
Verneuilinoides sp. cf. V. graciosus KOSYREVA var. 1																																
V. sp. cf. V. graciosus KOSYREVA var. 2																																
V. sp. cf. V. graciosus KOSYREVA var. 3 type A																																
V. sp. cf. V. graciosus KOSYREVA var. 3 type B																																
Eggerella (Eomarssonella) paraconica LEVINA	X	▶	▶	X	●																											
E. (E.) sp. cf. E. (E.) paraconica LEVINA																							●									
Orientalia sp. 6 - 17	■	■	▶	■	■	╲																										
O. sp. 6 - 17 subsp. 1	▶	●	╲	╲	X																											
O. sp. 6 - 17 subsp. 2																																
O. sp. 7 - 13																							●									
Citharinella sp. 5 - 32																																
Dentalina sp. 5 - 30																																
D. sp. 5 - 31																																
D. spp.								╲	X		╲	X	X																			
Geinitzinita praenodulosa DAIN																																
Marginulina brevis PAALZOW																																
Marginulinopsis sp. 5 - 28																																
M. sp. 5 - 32																																
M. spp.									●	●	●	●	▶		╲																	

S = Single

╲ = 1 to 3

X = 4 t

▶ = 11 t



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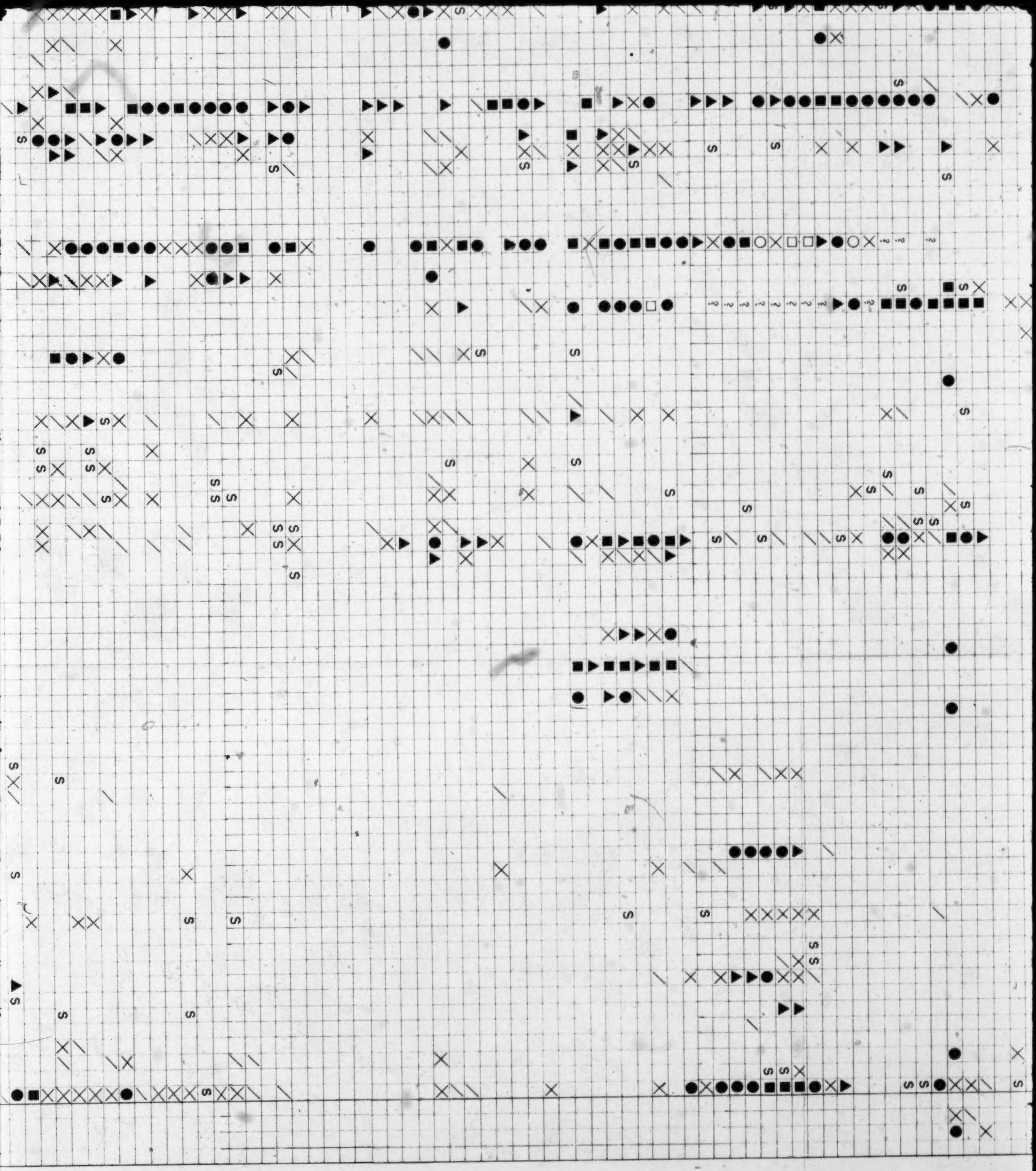

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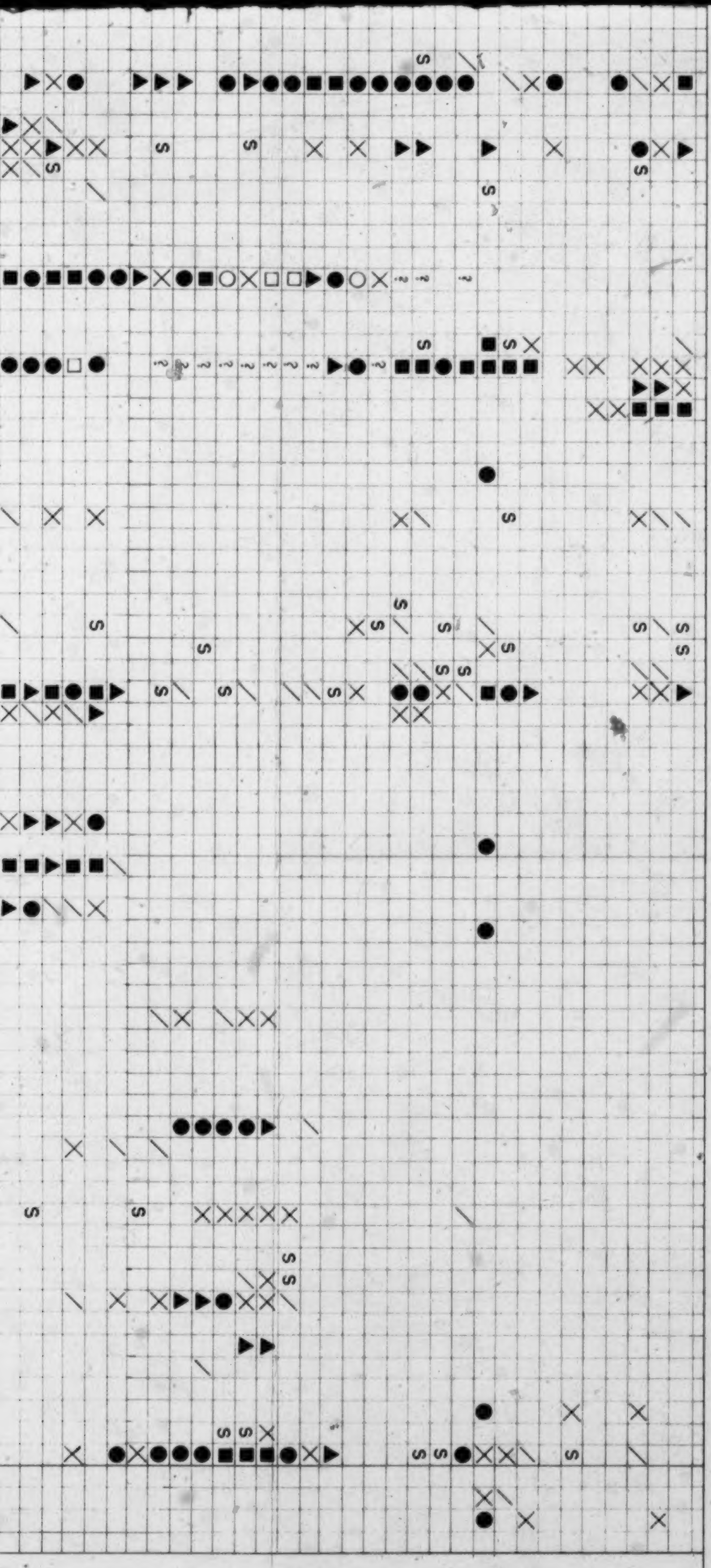

UTION CHART, 100 and 200 Mesh Fractions

Haplophragmoides sp. cf. H. fryssa LOEBLICH & TAPPAN
H. sp. cf. H. fryssa LOEBLICH & TAPPAN var. 1
H. sp. cf. H. fryssa LOEBLICH & TAPPAN var. 2
Cribrostomoides sp. indet.
Recurvoides canningensis (TAPPAN)
R. sp. 5 - 11
R. spp. (juv.)
Trochamminoides sp. 6 - 13
Trochammina sp. cf. T. elevata DAIN
T. sp. cf. T. elevata DAIN subsp. 1
T. kosyrevae LEVINA (juv.)
T. omskensis KOSREVA
T. sp. 5 - 25
T. sp. 5 - 13
T. sp. 5 - 27
T. sp. 7 - 13A
T. sp. 7 - 13B
T. sp. 7 - 20
T. sp. 7 - 21
Ammosphaerodina sp. 5 - 23
Ammobaculoides sp. 5 - 24
A. sp. 7 - 13
Spiroplectammina sp. 1
Textularia areoplecta TAPPAN
T. sp. 5 - 20
Pseudobolivina sp. 5 - 27
P. sp. 5 - 19
Siphotextularia sp. 5 - 4
S. sp. 5 - 5
S. sp. 7 - 13
S. sp. 5 - 10
Verneuilina sp. cf. V. anglica CUSHMAN var. 1
V. sp. cf. V. anglica CUSHMAN var. 2
Verneuilinoides sp. cf. V. graciosus KOSYREVA var. 1
V. sp. cf. V. graciosus KOSYREVA var. 2
V. sp. cf. V. graciosus KOSYREVA var. 3 type A
V. sp. cf. V. graciosus KOSYREVA var. 3 type B
Eggerella (Eomarssonella) paraconica LEVINA
E. (E.) sp. cf. E. (E.) paraconica LEVINA
Orientalia sp. 6 - 17
O. sp. 6 - 17 subsp. 1
O. sp. 6 - 17 subsp. 2
O. sp. 7 - 13
Citharinella sp. 5 - 32
Dentalina sp. 5 - 30
D. sp. 5 - 31
D. spp.
Geinitzinita praenodulosa DAIN
Marginulina brevis PAALZOW
Marginulinopsis sp. 5 - 28
M. sp. 5 - 32
M. spp.
Lenticulina spp.
Nodosaria sp. 5 - 28
N. sp. 5 - 34 A
N. spp.
"Pseudonodosaria" sp. aff. P. quinquecostata (Bornemann)
Pseudonodosaria brandi (TAPPAN)
Planularia spp.
Saracenaria phaedra TAPPAN
S. sp. 5 - 28
S. spp.
Tristix (Quadratina) sp.
Ceratocancris sp. cf. C. ambitiosus DAIN
Conorboides sp. 5 - 29
Pseudolamarckina sp. cf. P. liapinensis DAIN
Polymorphinids (undifferentiated)

Verneuilina sp. A
Verneuilinoides sp. A
Verneuilinoides sp. cf. V. postgraciosus KOMMISARENKO

S = Single
/ = 1 to 3
X = 4 to 10
▶ = 11 to 20
● = 21 to 50
■ = > 50

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TABLE Ib DISTRIBUTION CHART: 60 and 80 MESH FRACTIONS Calcareous Foraminifers

SAMPLE NO.	Astacolus sp cf A. praesibirensis DAIN	A. sp. 6-16	A. sp. 5-32	A. sp. indet.	Citharina sp. 5-29	Dentalina sp cf. D. ejuncida LOEBLICH & TAPPAN	D. sp. 5-29	D. sp. 5-32-1	D. sp. 5-32-2	D. sp. indet.	Geinitzinita praenodulosa DAIN	Ichtyolaria ( ) sp. 29131	Lenticulina gerkei DAIN	L. sp. cf. L. audax LOEBLICH & TAPPAN	L. sp. 5-29-B	L. sp. 5-32	L. sp. 7-3	L. sp. indet.	Marginulina sp. cf. M. breviformis (TERQUEM & BERTHELIN)	Marginulinopsis sp. 6-21	M. sp. 6-21 subsp. A	M. sp. 5-32	Nodosaria sp. 5-28	N. sp. 5-34	Planularia sp. 7-3
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75-7-2		▲						X		X										▲					/
75-7-1								S	/								X			▲	S				/
75-6-22		/															S	/		▲	S				
75-6-21		X															/	/		▲					X
75-6-20		/									S						S			/					▲
75-6-19																	/	X							S
75-6-18		▲																▲							
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75-6-5																									
75-6-4																									

SAMPLE NO.	Pseudonodosaria brandi (TAPPAN)	P. sp. 5-28	P. sp. 6-24	P. sp. 7-1	Saracenaria phaedra TAPPAN	S. sp. cf. S. cypha LOEBLICH & TAPPAN	S. sp. cf. S. cypha LOEBLICH & TAPPAN var. I	S. sp. 7-29A	S. sp. 7-3	S. sp. indet.	Tristix sp. cf. T. inornata (LOEBLICH & TAPPAN)	Tristix (s.l.) sp. 6-20	Vaginulinopsis sp. cf. V. enodis LOEBLICH & TAPPAN	V. sp. 6-20	V. sp. 7-3	Globulina alexandrae DAIN	Guttulina sublimis DAIN		Polymorphinids (undifferentiated)	Spirillina spp.		Ceratocancris sp. cf. C. ambitiosus DAIN	Conorboides sp. 5-29	C. sp. indet.	
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TABLE Ib DISTRIBUTION CHART 60 and 80 MESH FRACTIONS Calcareous Foraminifers

AMPLE NO.	Astacolus sp cf A. praesibirensis DAIN	A. sp. 6-16	A. sp. 5-32	A. sp. indet.	Citharina sp. 5-29	Dentalina sp cf. D. ejuncida LOEBLICH & TAPPAN	D. sp. 5-29	D. sp. 5-32-1	D. sp. 5-32-2	D. sp. indet.	Geinitzinita praenodulosa DAIN	Ichtyolaria ( ) sp. 29131.	Lenticulina gerkei DAIN	L. sp. cf. L. audax LOEBLICH & TAPPAN	L. sp. 5-29-B	L. sp. 5-32	L. sp. 7-3	L. sp. indet.	Marginulina sp. cf. M. breviformis (TERQUEM & BERTHELIN)	Marginulinopsis sp. 6-21	M. sp. 6-21 subsp. A	M. sp. 5-32	Nodosaria sp. 5-28	N. sp. 5-34	Planularia sp. 7-3	Pseudonodosaria brandi (TAPPAN)	P. sp. 5-28	P. sp. 6-24	P. sp. 7-1	Saracenaria phaedra TAPPAN	S. sp. cf. S. cypha LOEBLICH & TAPPAN	S. sp. cf. S. cypha LOEBLICH & TAPPAN var. 1	S. sp. 7-29A	S. sp. 7-3	S. sp. indet.	Tristix sp. cf. T. inornata (LOEBLICH & TAPPAN)	Tristix (s.l.) sp. 6-20	Vaginulinopsis sp. cf. V. enodis LOEBLICH & TAPPAN	V. sp. 6-20	V. sp. 7-3	Globulina alexandrae DAIN	Guttulina sublimis DAIN		Polymorphinids (undifferentiated)	Spirillina spp.		Ceratocancris sp. cf. C. ambitiosus DAIN	Conorboides sp. 5-29	C. sp. indet.	
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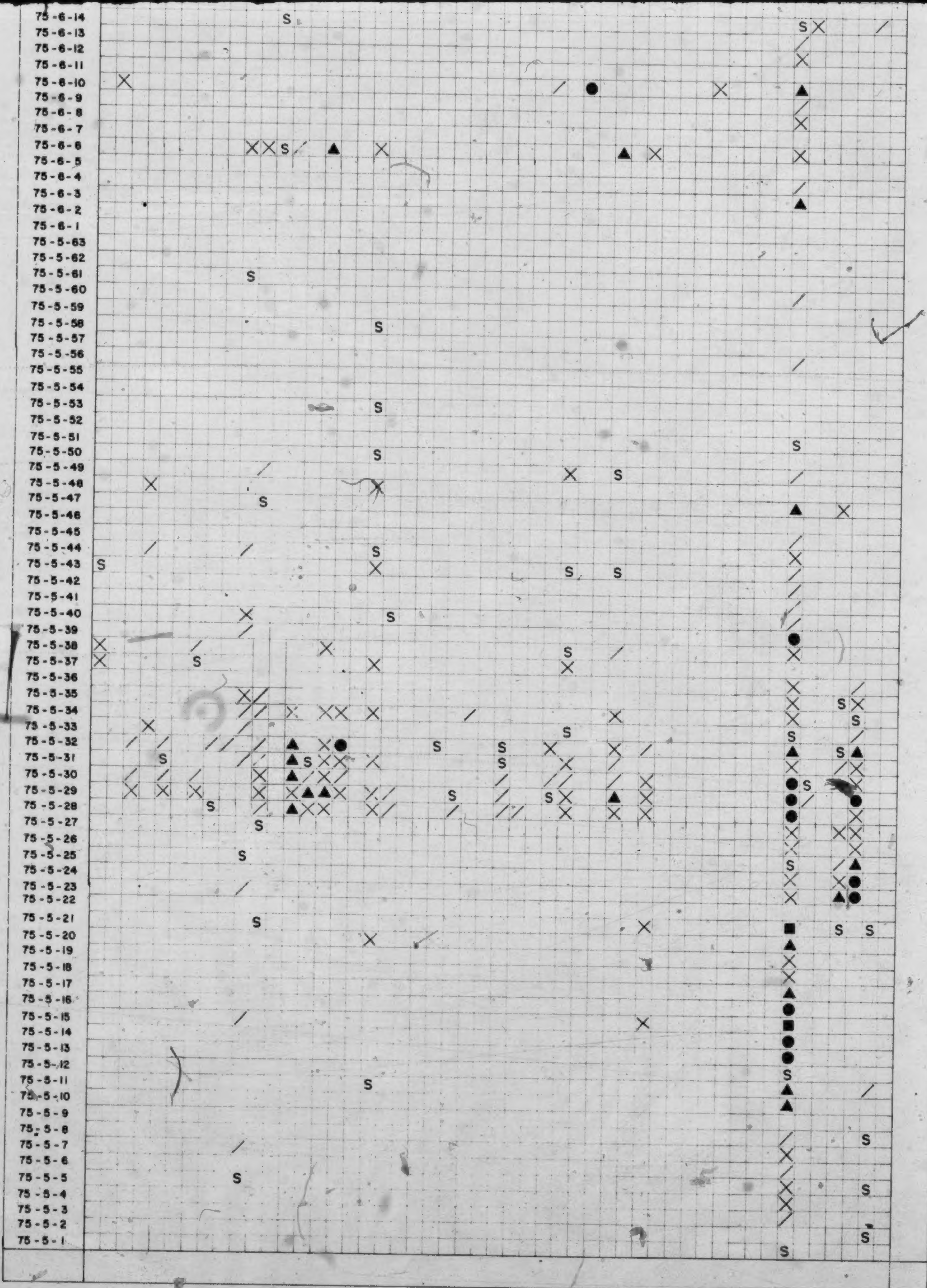

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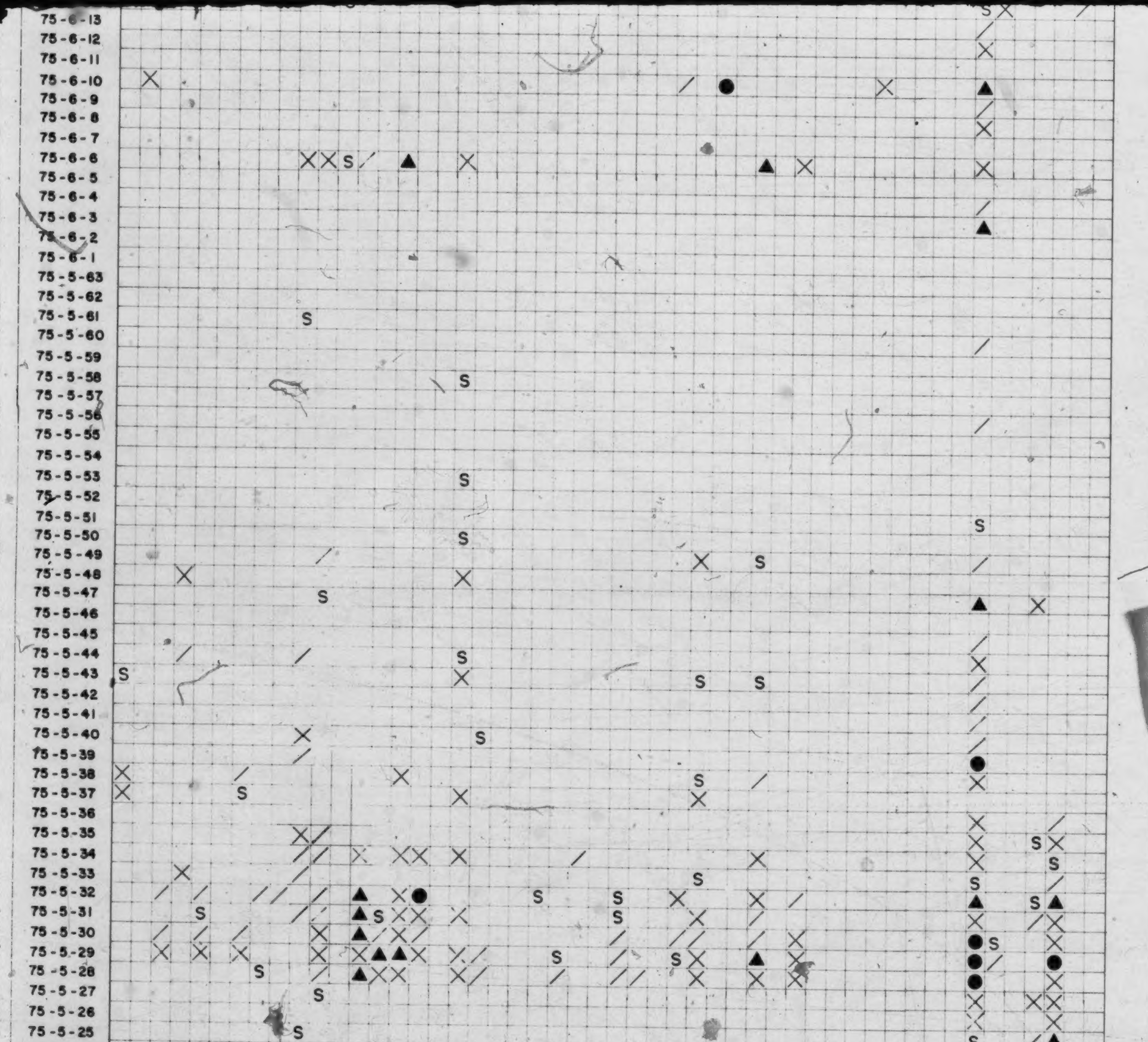
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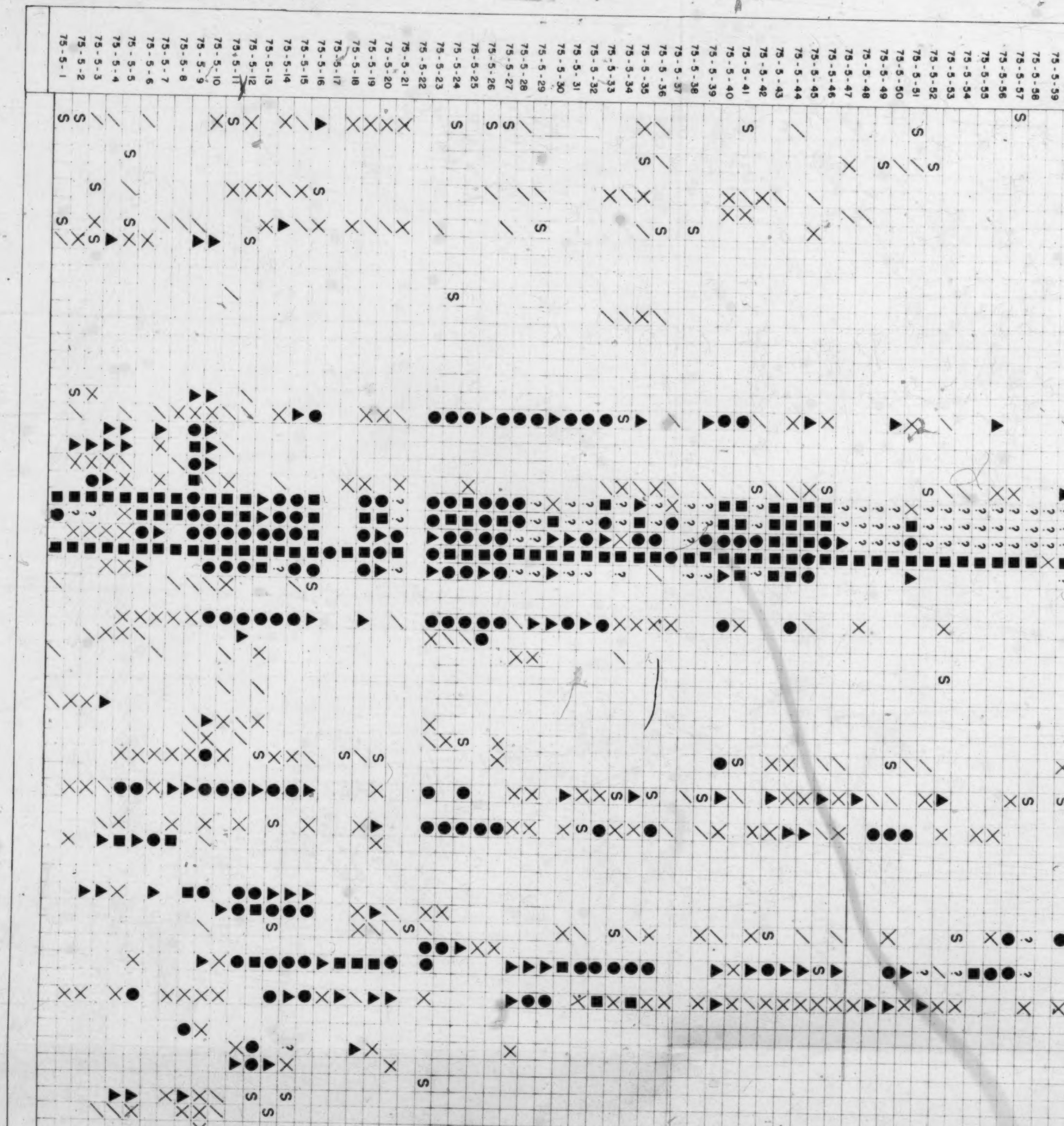
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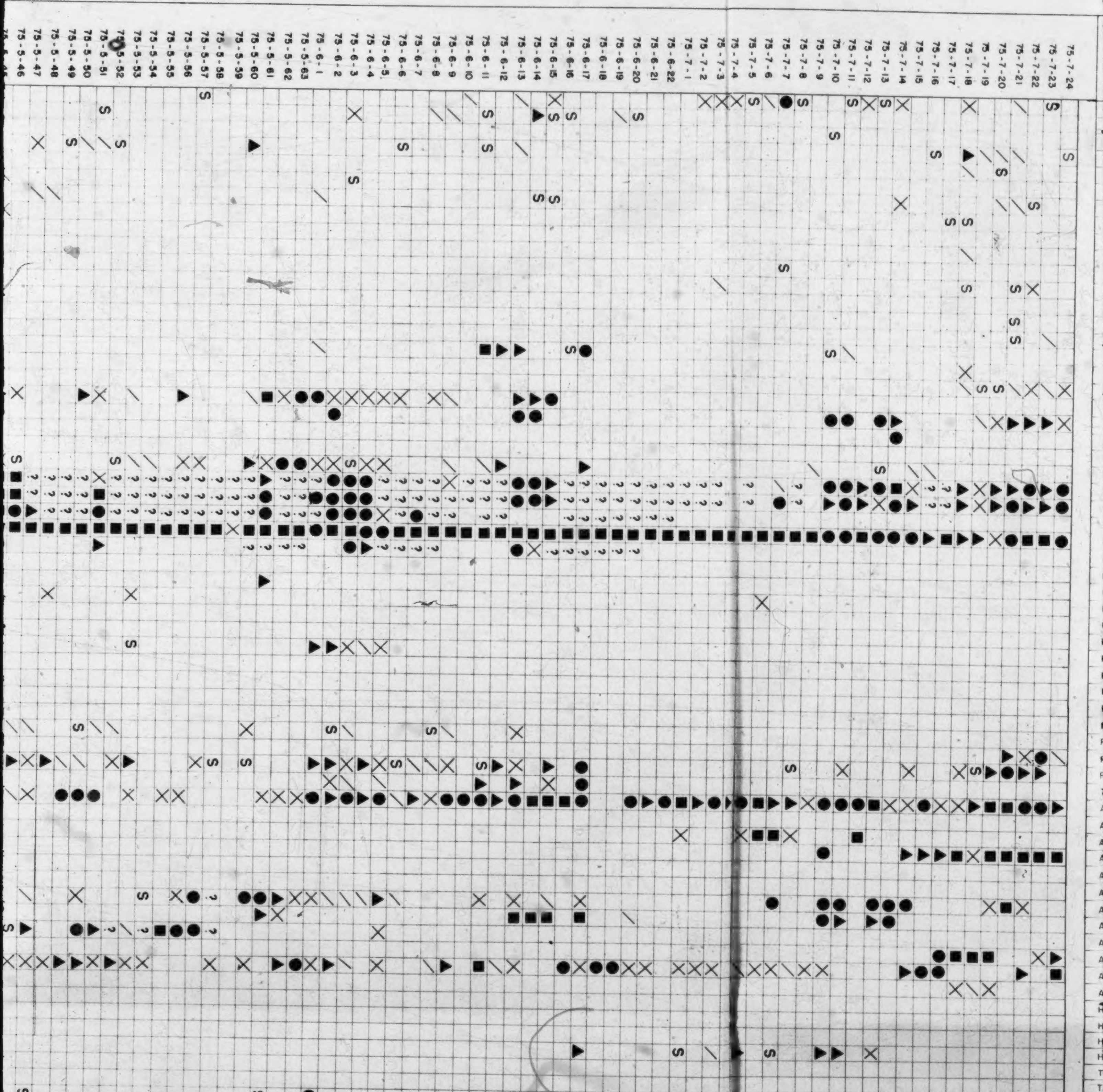
75-5-59

201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75-7-15
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75-7-21
75-7-22
75-7-23
75-7-24
S
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[3 of]

TABLE Ia DISTRIBUTION CHART, 60 and 80 MESH FRACTIONS

Arenaceous Foraminifers

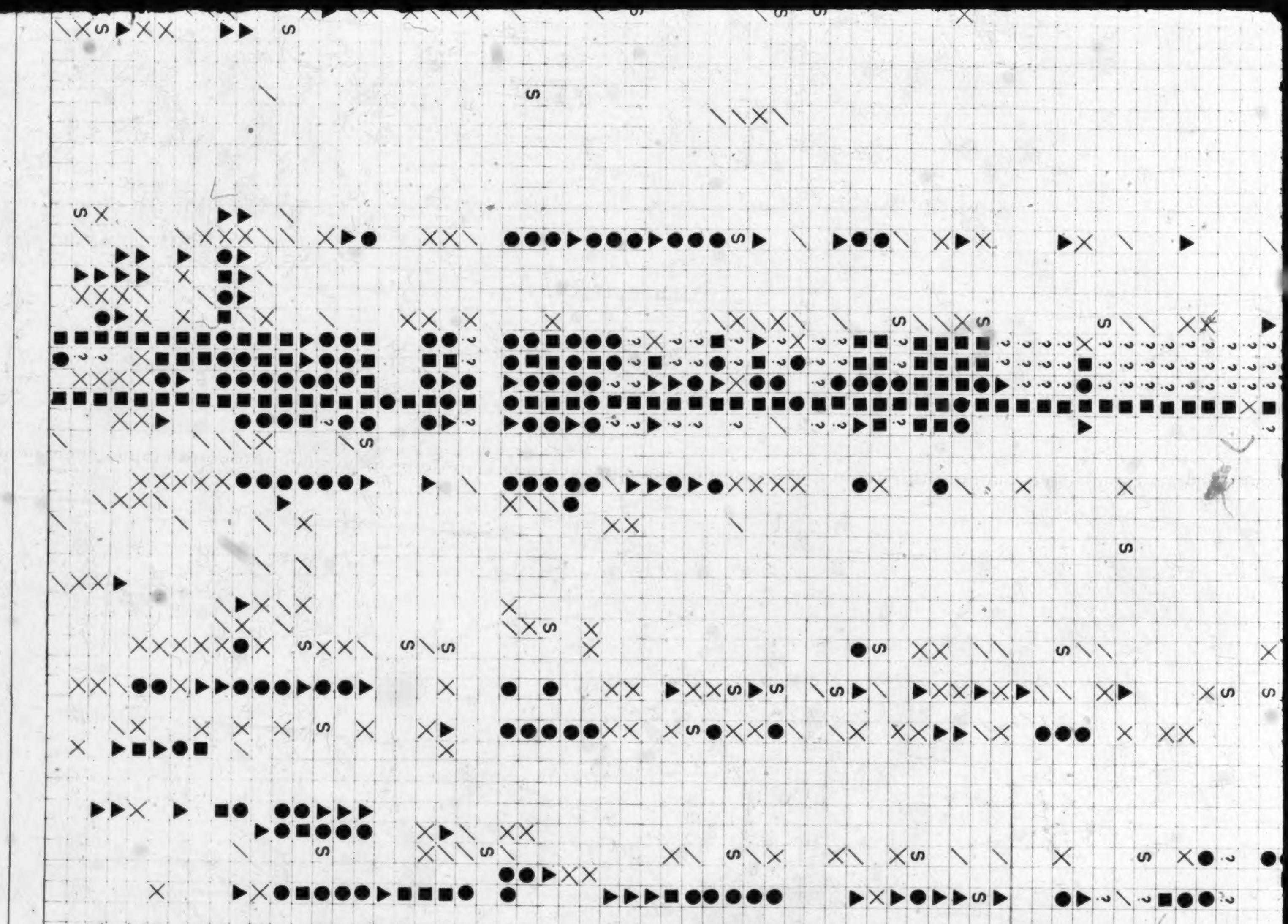
S = Single ╳ = 4 to 10
/ = 1 to 3 ▲ = 11 to 20

SAMPLE NO.	Saccammina sp. cf. S. lathrami TAPPAN	S. sp. 5-6	S. sp. 7-10	Bathysiphon sp.	Lituotuba sp. 7-18	Ammodiscus orbis LALICKER	A. sp. cf. A. orbis LALICKER	A. sp. cf. A. cheradospirus LOEBLICH & TAPPAN	A. sp. cf. A. silicea TERQUEM	A. sp. 7-18	Hippocrepina sp. 7-7	Glomospira spp.	Arenoturrispirillina sp. cf. A. intermedia CHAMNEY	"Arenoturrispirillina" sp. cf. "A." waltoni CHAMNEY	"A" sp. 7-22	"Tolypammina" sp. 6-11	"T." sp. 7-18
75-7-24				S													
75-7-23	S														/		
75-7-22							S					X					
75-7-21	/			/			/					S		S	S		
75-7-20				/	S		/										
75-7-19				/													
75-7-18	X			▲	/			S		/		S					X
75-7-17								S									
75-7-16				S													
75-7-15																	
75-7-14	X						X										
75-7-13	S																
75-7-12	X																
75-7-11	S															/	
75-7-10			S													S	
75-7-9																	
75-7-8	S																
75-7-7	●										S						
75-7-6	/																
75-7-5	S																
75-7-4	X																
75-7-3	X											/					
75-7-2	X																
75-7-1																	
75-6-22																	
75-6-21																	
75-6-20		S															
75-6-19		/															
75-6-18																	
75-6-17																●	
75-6-16		S														S	
75-6-15	X	S					S										
75-6-14		▲					S										
75-6-13	/			/												▲	

SAMPLE NO.	"T." spp.	Reophax metensis FRANKE	R. sp. cf. R. adaptatus DAIN	R. sp. cf. R. densa TAPPAN	R. sp. 5-10	R. spp.	Cribrostomoides canui (CUSHMAN)	C. goodenoughensis (CHAMNEY)	C. sp. cf. C. mirandus DAIN	C. spp.	Evolutinella sp. 5-25	Haplophragmoides sp. cf. H. tryssa LOEBLICH & TAPPAN	H. sp. 5-61	Recurvoides canningensis (TAPPAN)	R. sublustris DAIN	R. sp. cf. R. sublustris DAIN	R. disputabilis DAIN	R. sp. cf. R. scherkalyensis LEVINA
75-7-24	X		X				●	●		●								
75-7-23	/		▲				▲	▲		■								
75-7-22	X		▲				●	▲		■								
75-7-21	/		▲				▲	●		●								
75-7-20	S		X				▲	▲		X								
75-7-19	S		/				X	X		▲								
75-7-18	/						▲	▲		▲								
75-7-17							?	?		■								
75-7-16						/	?	?		▲								
75-7-15						/	X	▲		●								
75-7-14			▲	●			■	●		●								
75-7-13			●			S	●	X		●								
75-7-12							▲	▲		■								
75-7-11			●				●	●		●								
75-7-10			●				●	▲		●								
75-7-9						/				■								
75-7-8							?	?		■								
75-7-7							/	●		■								
75-7-6										■				X				
75-7-5							?	?		■								
75-7-4										■								
75-7-3							?	?		■								
75-7-2							?	?		■								
75-7-1							?	?		■								
75-6-22							?	?	?	■								
75-6-21							?	?	?	■								
75-6-20							?	?	?	■	?							
75-6-19							?	?	?	■	?							
75-6-18							?	?	?	■	?							
75-6-17						▲	?	?	?	■	?							
75-6-16							?	?	?	■	?							
75-6-15		●					▲	▲		■	?							
75-6-14		▲	●				●	●		■	X							
75-6-13		▲	●				●	●		■	●							

SAMPLE NO.	R. sp. 5-4	R. sp. 5-10-A	R. sp. 5-10-B	R. sp. 5-11	R. sp. 7-23	R. spp. - including juveniles	Trochamminoides sp. 6-13	Ammobaculites alaskensis TAPPAN (restricted)	A. alaskensis TAPPAN subsp. I	A. sp. 7-7	A. sp. 7-10	A. sp. 5-9	A. sp. 5-13	A. sp. 5-36	A. sp. cf. A. multiformis DAIN & var.	A. sp. 5-31	A. venustus LOEBLICH & TAPPAN
75-7-24					/			▲			■						▲
75-7-23					●	▲		●			■						X
75-7-22					X	▲		●			■			X			
75-7-21					▲	●		■			■			■			
75-7-20						▲		■			■			X			■
75-7-19						S		▲			X						■
75-7-18						X		X			■						■
75-7-17								X			▲						●
75-7-16								●			▲						
75-7-15						X		X			▲			●			
75-7-14								X						●	●		
75-7-13								■						●	▲		
75-7-12								●		■							
75-7-11						X		●						●	▲		
75-7-10								●			●			●	●		
75-7-9								X									
75-7-8						S		▲		X							
75-7-7								▲		■				●			
75-7-6								■		■							
75-7-5								●		X							
75-7-4								▲									
75-7-3								●									
75-7-2								▲									
75-7-1								■		X							
75-6-22								●									
75-6-21								▲									
75-6-20								●							/		
75-6-19																	
75-6-18																	
75-6-17						●	●	●						X	■		
75-6-16								■									
75-6-15						▲	X	■						/	■		
75-6-14								■							■		
75-6-13				X		X	▲	●						X	■		

SAMPLE NO.	A. spp.	Ammobaculoides sp. 7-18	Haplophragmium sp. 5-9	H. sp. 5-12	H. sp. 5-13	H. spp.	Trochammina kosyrevae LEVINA	T. sp. cf. T. rostovzevi LEVINA	T. sp. cf. T. elevata DAIN	T. sp. cf. T. elevata DAIN subsp. I	T. omskensis KOSYREVA	T. sp. 29109	T. sp. 5-25	T. sp. 5-27	T. sp. 7-13A	T. sp. 7-13B	
75-7-24	■																
75-7-23																	X
75-7-22	▲													S			X
75-7-21									X					/			●
75-7-20		X															▲
75-7-19		/														S	
75-7-18		X															/
75-7-17	●															S	
75-7-16	●																
75-7-15	▲															X	
75-7-14																●	
75-7-13						X			/					X			
75-7-12																S	
75-7-11						▲											
75-7-10	X					▲										X	
75-7-9	X															S	
75-7-8	/																
75-7-7	X					S										/	
75-7-6	X																
75-7-5	/					▲											
75-7-4																	
75-7-3	X					/											
75-7-2	X																
75-7-1	X					S											
75-6-22													/				
75-6-21	X																
75-6-20	X																
75-6-19	●																
75-6-18	●																
75-6-17	X					▲							X				
75-6-16	●												S				
75-6-15													X				
75-6-14																	
75-6-13	X																



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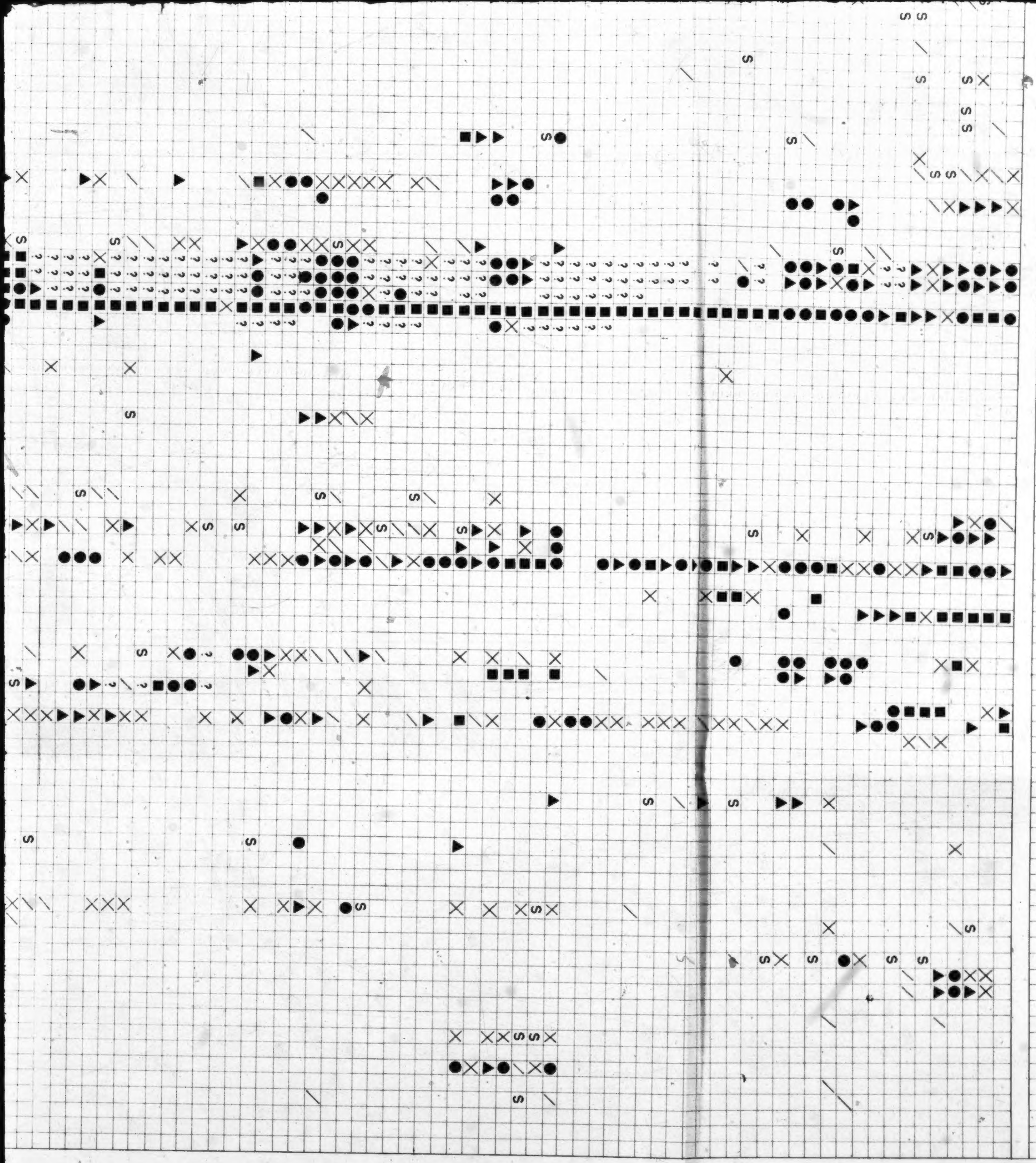
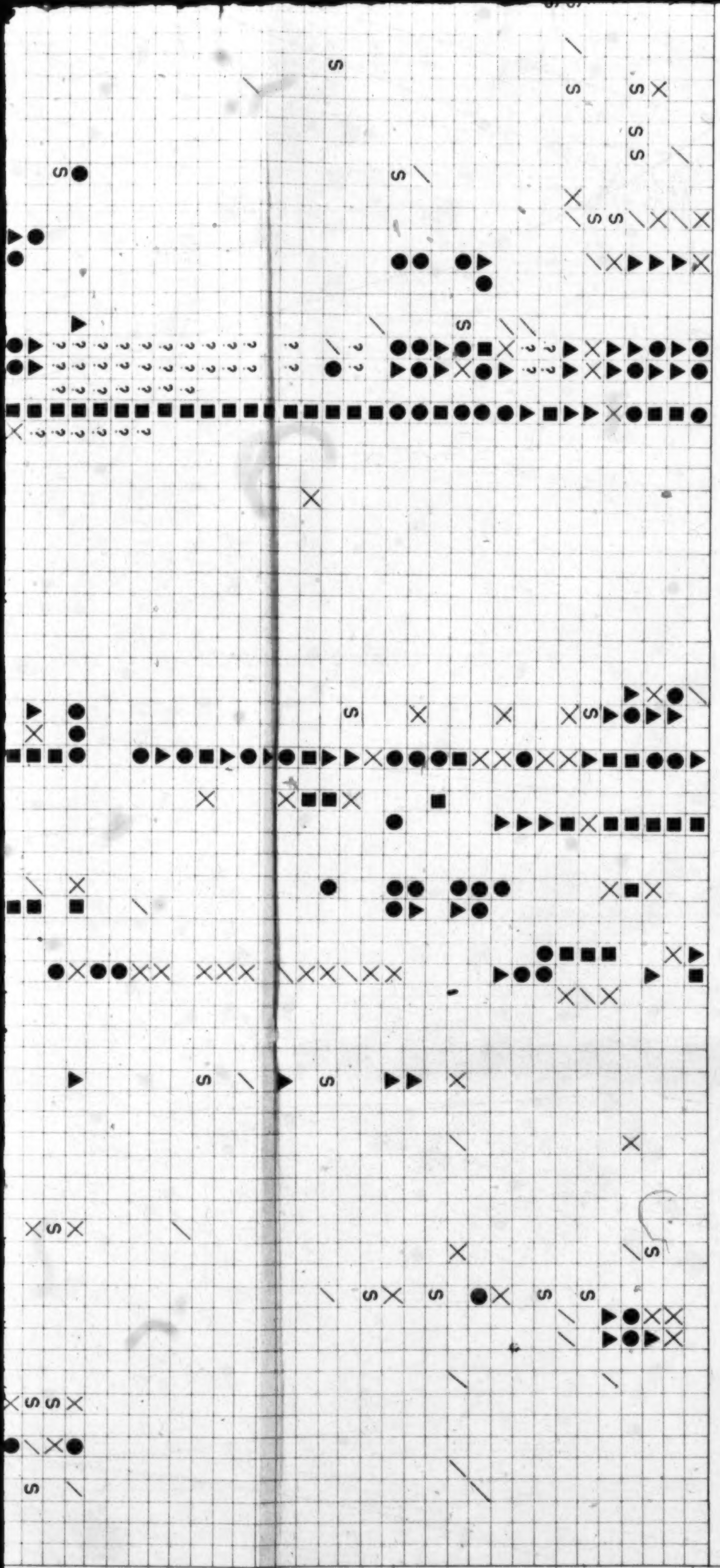


5cf

1a DISTRIBUTION CHART. 60 and 80 MESH FRACTIONS

Arenaceous Foraminifers



A. sp. cf. A. cheradospirus LOEBLICH & TAPPAN
A. sp. cf. A. silicea TERQUEM
A. sp. 7-18
Hippocrepina sp. 7-7
Glomospira spp.
Arenoturrispirillina sp. cf. A. intermedia CHAMNEY
"Arenoturrispirillina" sp. cf. "A." waltoni CHAMNEY
"A" sp. 7-22
"Tolypammina" sp. 6-11
"T." sp. 7-18
"T." spp.
Reophax metensis FRANKE
R. sp. cf. R. adaptatus DAIN
R. sp. cf. R. densa TAPPAN
R. sp. 5-10
R. spp.
Cribrostomoides canui (CUSHMAN)
C. goodenoughensis (CHAMNEY)
C. sp. cf. C. mirandus DAIN
C. spp.
Evolutinella sp. 5-25
Haplophragmoides sp. cf. H. tryssa LOEBLICH & TAPPAN
H. sp. 5-61
Recurvoides canningensis (TAPPAN)
R. sublustris DAIN
R. sp. cf. R. sublustris DAIN
R. disputabilis DAIN
R. sp. cf. R. scherkalyensis LEVINA
R. sp. 5-4
R. sp. 5-10-A
R. sp. 5-10-B
R. sp. 5-11
R. sp. 7-23
R. spp. - including juveniles
Trochamminoides sp. 6-13
Ammobaculites alaskensis TAPPAN (restricted)
A. alaskensis TAPPAN subsp. 1
A. sp. 7-7
A. sp. 7-10
A. sp. 5-9
A. sp. 5-13
A. sp. 5-36
A. sp. cf. A. multiformis DAIN & var.
A. sp. 5-31
A. venustus LOEBLICH & TAPPAN
A. spp.
Ammobaculoides sp. 7-18
Haplophragmium sp. 5-9
H. sp. 5-12
H. sp. 5-13
H. spp.
Trochammina kosyrevae LEVINA
T. sp. cf. T. rostovzevi LEVINA
T. sp. cf. T. elevata DAIN
T. sp. cf. T. elevata DAIN subsp. 1
T. omskensis KOSYREVA
T. sp. 29109
T. sp. 5-25
T. sp. 5-27
T. sp. 7-13A
T. sp. 7-13B
T. sp. 7-20
T. sp. 7-21
T. spp.
Ammosphaeroidina sp. 5-23
Eggerella (Eomarssonella) paraconica LEVINA
E. (E.) sp. cf. E. (E.) paraconica LEVINA
Orientalia sp. 6-17 & var.
O. sp. 7-13
Verneuilina spp.
Verneuilinoides spp.

S = Single
/ = 1 to 3
X = 4 to 10
▲ = 11 to 20
● = 21 to 50
■ = > 50

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